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TABLE 3-9
PROPOSED OFFSITE MONITORING WELL INSTALLATION PROGRAM
WHITMOYER LABORATORIES SITE
PAGE TWO

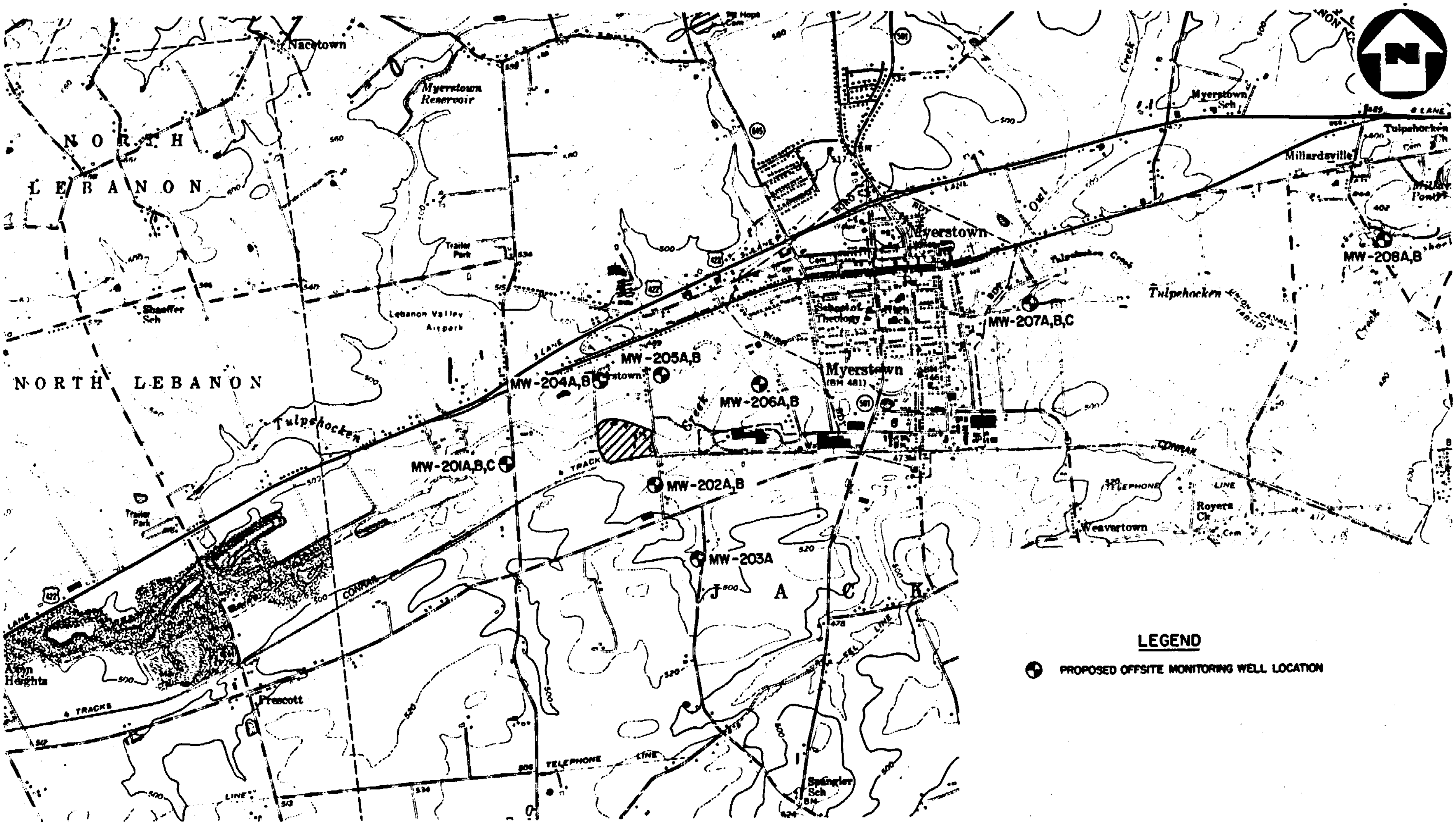
Well No.	Depth	Const. Type	Direction From Site	Purpose					Notes
				Water Quality	Shallow GW Flow Directions	Vertical Gradients	Secondary Source Area I.D.	SW/GW Inter-actions	
MW-205B	M	PVC	N	X		X		X	Near ponds northeast of site. Determine whether site groundwater is migrating to ponds. Determine whether groundwater is discharging to ponds.
MW-206A	S	OB	E	X	X	X		X	Located in area where inferred fault crosses Tulpehocken Creek. Check for concentration of contaminants in fault zone.
MW-206B	M	PVC	E	X		X		X	Located in area where inferred fault crosses Tulpehocken Creek. Check for concentration of contaminants in fault zone.
MW-207A	S	OB	E	X	X	X		X	Adjacent to large pond east of Myerstown. Determine water quality and groundwater/surface water interactions in the pond vicinity.
MW-207B	M	PVC	E	X		X		X	Adjacent to large pond east of Myerstown. Determine water quality and groundwater/surface water interactions in the pond vicinity.
MW-207C	D	PVC	E	X		X		X	Adjacent to large pond east of Myerstown. Determine water quality and groundwater/surface water interactions in the pond vicinity. Check to see if pond is deep groundwater discharge point.
MW-208A	S	OB	E	X	X	X		X	Adjacent to large pond near Millardsville. Determine whether contaminant plume has reached Millardsville area.
MW-208B	M	PVC	E	X		X		X	Adjacent to large pond near Millardsville. Determine whether contaminant plume has reached Millardsville area.

S - Shallow
M - Medium
D - Deep

OB - Open Borehole Monitoring Well
PVC - PVC Monitoring Well

17 Offsite MW's

300290



LEGEND

PROPOSED OFFSITE MONITORING WELL LOCATION

0 2000 4000
SCALE IN FEET

FIGURE 3-7

NUS CORPORATION

PROPOSED OFFSITE MONITORING WELL LOCATIONS
WHITMOYER LABORATORIES SITE, MYERSTOWN, PA

Based on a review of existing data (see Section 2.2.5) and prioritization of possible source areas, it was decided not to conduct any sampling efforts at the sewage sludge disposal sites. Due to the small mass of arsenic placed at these sites, the sites do not appear to pose a significant threat to public health and/or the environment.

3.3.17 Summary of Proposed RI Field Activities

The onsite activities proposed for the Whitmoyer Laboratories Site are designed to provide data with which to assess the current conditions within the site and to identify and characterize potential source areas. Much of the currently available data is a 10-20 years old and an updated data base is required for evaluating site conditions and potential remedial alternatives. As the entire site and surrounding area is contaminated, based on previous investigation findings, the emphasis of the onsite studies is on characterizing potential sources rather than delineating the extent of contamination.

The offsite investigation emphasizes determining the distribution and relative concentrations of contaminants rather than determining the absolute extent of contamination. Since an area greater than 6 miles east-west by 1.5 miles north-south had already been affected by the site by the late 1960s, attempting to find the limits of contamination 20 years later is not considered to be time or cost effective; nor would it be likely to achieve any significant degree of success without considerable cost and time expenditures. The offsite studies, as proposed, are designed to find the limits of the area of significant risk to the population and environment rather than finding the absolute limit of contamination.

Table 3-10 summarizes proposed field activities. While the number of samples may seem high, it must be noted that the RI/FS incorporates investigations of numerous known and potential source areas and media. A primary RI/FS objective is to achieve Records of Decision (RODs), as early as possible, and potentially-responsible party (PRP) cost recovery actions are anticipated at this site. A summary of the analytical program is given in Section 4.4.

Detailed descriptions of the methodology for each task and the rationale for sample collection are presented in Section 4.0, Task Plan for the RI.

TABLE 3-10

INVESTIGATIVE SUMMARY
WHITMOYER LABORATORIES SITE

Unit/Media	No. of Wells	No. of Soil Borings	No. of Test Pits	No. of Groundwater Samples	No. of Soil Samples	No. of Other Samples
Vault	4	5		8	13	33 tracer samples
Consolidated Lagoons	4	13		6	39	8 lysimeter samples
Excavated Lagoons	3	6	11	6	26	
Process Buildings	3	3		6	8	150 wipe samples; 10 asbestos samples; 12 air samples; 50 piping samples; 7 runoff samples
Waste Drums and Tanks						40 waste samples
Laboratory Wastes						100 waste samples
Waste Pits (Buildings 6, 9, & 11)	6		4	12	10	
1951 Pit	1		3	2	8	
Photographic Anomalies	5		18	10	45	
DDAA Storage Areas			4		10	
Drum Storage Areas		10			25	
Non-Source-Related On-Site Soils		18			45	
Off-Site Soils		22			61	85 soil attenuation samples (40 liquid)
Surface Water						64 surface water samples
Sediment						20 sediment samples
Biota						16 (8 whole and 8 edible fish tissue)
Non-Source-Related On-Site and Off-Site Wells	26			52		16 residential wells

$\Sigma = 52$

300302

4

4.0 TASK PLAN FOR REMEDIAL INVESTIGATION

This section identifies and presents a description of the tasks that will be implemented to conduct the RI for the Whitmoyer Laboratories site. The RI will consist of the eight standard tasks described in the June 12, 1986, memorandum from USEPA's Hazardous Site Control Division, as defined below:

- Task 1 - Project Planning
- Task 2 - Community Relations
- Task 3 - Field Investigation
- Task 4 - Sample Analysis and Data Validation
- Task 5 - Data Evaluation
- Task 6 - Endangerment Assessment (EA)
- Task 7 - Treatability Study/Pilot Testing
- Task 8 - Remedial Investigation Report

Section 5.0 provides a detailed description of the three FS tasks and one post-RI/FS support task. These 12 together comprise the overall program for the Whitmoyer Laboratories Site.

4.1 TASK 1 - PROJECT PLANNING

The performance of this task results in the preparation and submittal of the Work Assignment Acknowledgment Letter (submitted to EPA on December 18, 1987, and modified on February 29, 1988), Draft Work Plan, Draft Field Operations Plan, Final Work Plan, and Final Field Operations Plan. The activities that comprise this task are

- Initiation of Project Work Assignment
- Project Kick-off Meeting
- Work Assignment Acknowledgment Letter Preparation
- Data Collection and Review
- Development of Interim Health and Safety Plan
- Site Reconnaissance
- ARAR/DQO Determination (Preliminary)
- Preliminary Risk Assessment
- RI/FS Brainstorming and Scoping Meetings
- Work Plan Preparation
- Field Sampling and Analysis Plan (FSAP) Preparation
- Site Management Plan (SMP) Preparation
- Health and Safety Plan (HASP) Preparation

The project plans prepared in Task 1 include two major plans:

1. Work Plan, this document, which presents the scope, cost, and schedule for the Whitmoyer RI/FS; and

2. Field Operations Plan (FOP), which is composed of three plans:

   - Field Sampling and Analysis Plan (FSAP) - includes the details of sampling and analytical objectives; the

300304

number, location, and rationale for each medium sampled; the site-specific quality assurance requirements; detailed sampling and analysis procedures; decontamination of sampling equipment procedures; and data management elements.

- Health and Safety Plan (HASP) - includes site-specific health and safety information, a hazard assessment, training requirements, health and safety monitoring procedures, personnel decontamination procedures, disposal procedures, and any other procedures in accordance with the REM III HASP. The HASP will be updated on a subtask-specific basis as needed.

- Site Management Plan (SMP) - includes a brief site description, an operations plan outlining the site project organization and responsibilities, and the field operations schedule. The plan also addresses site security and access.

Because of the nature of this investigation (approximately 30 potential source areas and media will be investigated), additional data collection efforts beyond the scope of this Work Plan may be necessary. If these efforts are required, a Technical Decision Memorandum (TDM) describing the efforts will be prepared

4.2 TASK 2 - COMMUNITY RELATIONS

A Draft and a Final Community Relations Plan (CRP) will be developed as part of this work assignment. The CRP will be prepared to assist the U.S. Environmental Protection Agency Region III in meeting the needs of the communities affected by the site. The CRP will contain information gathered during onsite interviews and telephone conversations regarding the Whitmoyer Laboratories Site.

In December 1987, the REM III team assisted the EPA at a public meeting discussing ongoing activities at the Whitmoyer Laboratories Site. The REM III team will provide the following support during the RI/FS:

- Preparation of 2 fact sheets.
- Participation at 2 public meetings.
- Preparation of meeting minutes.

Specifically, a public meeting will be held upon completion of the Work Plan and RI/FS Report. Preparation of a Responsiveness Summary will be discussed under Task 12.

4.3 TASK 3 - FIELD INVESTIGATION

This task describes the methodologies proposed to implement the various field investigations that were described previously in Section 3.0 and will be conducted to collect data for meeting

300305

the specific Phase I RI/FS objectives. The following field investigations will be performed as part of the RI:

- Source Areas Investigations
- Soil Investigations
- Surface Water and Sediment Investigation
- Offsite Hydrogeologic Investigation

4.3.1 Initial Activities

4.3.1.1 Preparation of Bid Specifications and Subcontractor Procurement

Under this subtask, bid specifications will be prepared and subcontractors will be procured for the preparation of a topographic map; for drilling and installation of monitoring wells, the drilling/sampling of test borings, the excavation of test pits; and for disposal of wastes generated during the field program. The preparation of the bid specifications will be conducted in conjunction with the development of this Work Plan in order to avoid delays when procuring applicable subcontractors, upon EPA approval of this RI/FS Work Plan.

The types of activities covered by each of these subcontracts are discussed below:

- A subcontractor will be required to conduct a topographic survey of the site and surrounding area and to establish benchmarks onsite. The survey and map preparation will be conducted concurrent with monitoring well installation, surface water and sediment sampling, soil sampling, and waste sampling to enable REM III surveyors to survey in these points.

- A subcontractor will be procured to perform existing monitoring well rehabilitation, new monitoring well drilling, installation, and development, test boring drilling/sampling, test pit excavating, and drum movement. Bid specifications will be prepared for these activities under this subtask in the initial stages of the RI.

- A subcontractor will be procured to transport and dispose wastes generated during the field program. Bid specifications will be prepared for these activities under this subtask once aquifer testing is completed and accurate concentrations of generated waste water can be measured.

- A subcontractor will be procured to perform compatibility testing on site for the laboratory wastes at the site, to bulk compatible wastes into drums ("lab packs"), and to sample these drums, for ultimate disposal. Sample analysis will not be a part of the subcontract. Bid specifications will be prepared under this subtask once EPA has approved the Work Plan.

4.3.1.2 Fracture Trace Analysis

Existing aerial photographs will be obtained for the site vicinity and surrounding areas. The photographs will be stereoscopically analyzed in pairs, using a mirror stereoscope, and fracture traces identified. The observed fracture traces will be plotted on an appropriate map, compared with the proposed monitoring well locations, then appropriate adjustments to well locations will be made. The photographs used for the Environmental Photographic Interpretation Center (EPIC) site analysis are of an appropriate scale to use for the fracture trace analysis. Reprints of these photographs will be obtained for analysis. Photographs for the local areas surrounding the site, including areas where offsite monitoring wells are to be installed, will also be obtained for analysis.

The fracture trace analysis will be performed by EPIC. The fracture trace plot map will be reviewed by the project geologist. Proposed well locations will be adjusted, if necessary, based on the analysis.

4.3.1.3 Mobilization

This subtask will consist of field personnel orientation and equipment mobilization and will be performed at the initiation of the field activities as necessary. A field team orientation meeting will be held at the NUS office to familiarize personnel with the site history, health and safety requirements, and field procedures.

Equipment mobilization may include, but will not be limited to, the setup of the following equipment:

- Field office trailer (command post)
- Sampling equipment
- Health and safety decontamination equipment

Electrical and telephone hookups will be installed and a local water source will be located. The mobilization/demobilization activities will provide the basis for a time- and cost-efficient field investigation. At this time, it is anticipated that the field trailer will be stationed on the WLI property in order to reduce the threat to vandalism.

4.3.1.4 Existing Monitoring Well Evaluation

Existing monitoring wells on site and in the site vicinity will be evaluated prior to the start-up of investigative activities. The wells will be located in the field, using available site maps, then an assessment of the physical condition of each well will be made. The following observations will be made and documented:

- Well Number.
- Well security (locked/unlocked).
- Condition of well casing and protective casing.
- Well casing material.
- Size of well casing.
- Depth to groundwater.
- Total depth of the well.
- Identification and depth determination of any obstructions within the well.

In addition to the above listed observations, any other pertinent observations that may be identified will be noted. The observed condition of the well will be compared with the original well logs, if available. Based on the field observations and on background information available, the existing wells will be evaluated as to their potential usefulness as sampling or water level measurement points, with selected wells integrated into the RI field investigation.

4.3.2 Site Investigation Activities

The following subsections describe the methodologies proposed to implement the field activities planned for each field investigation described in Section 3.0. Several of the field activities (monitoring well drilling/installation/sampling, test boring drilling/sampling, test pit excavation/sampling, and surface soil sampling) are common to a number of the individual investigations proposed. These activities are described in detail in Section 4.3.2.1, General Field Activities, then referred to briefly in the sections describing each individual investigation approach, as applicable, to avoid unnecessary repetition. Methodologies for field activities which are specific to an investigation are described in detail in the section corresponding to that investigation.

4.3.2.1 General Field Activities

Monitoring Well Drilling/Installation/Sampling

Three types of monitoring wells are proposed for the Whitmoyer Laboratories Site field investigation: shallow, medium depth, and deep monitoring wells. Shallow monitoring wells will be used to monitor the first water-bearing zone encountered (excluding perched water zones) and are designed to provide information regarding shallow groundwater quality and flow directions. These wells are expected to average approximately 30 to 40 feet in depth. Medium depth monitoring wells are designed to provide water quality data for the deeper, well developed flow zone identified in regional studies (Meisler, 1963; see Section 2.2.2.2) within the 70- to 80-foot depth interval. An examination of available boring logs for site-related monitoring wells reveals that slight increases in the number of fractures encountered occurred within the depth intervals of 50 to 60 and 75 to 100 feet. Based on this

300308

information, medium depth monitoring wells are expected to range from 55 to 100 feet in depth. Deep monitoring wells are proposed to obtain water quality data from flow zones less affected by local recharge/discharge conditions and provide information regarding possible alterations in groundwater flow directions between shallow, local flow systems and a deeper, more regional flow system. As fractures are generally more infrequently encountered with increasing depth, the projected average depths of the deep monitoring wells are difficult to predict with any degree of accuracy, however, it is expected that the wells will range from approximately 150 to 250 feet in depth. Detailed discussions regarding the proposed monitoring well installation program and the rationale for each proposed well are presented in the individual investigation discussions in Section 3.

All monitoring well borings will be drilled using air rotary or air hammer drilling methods. Shallow monitoring well borings will be drilled through the overburden and approximately 3 to 5 feet into rock, then 6-inch-diameter steel casing will be set and cement grouted into place. After allowing the grout to set up overnight, the boring will be continued into bedrock until a significant water-yielding fracture or set of fractures (approximately 2+ gpm) is encountered. Once an adequate water-yielding zone is encountered, the boring will be terminated and left as an open borehole monitoring well. Exceptions to this drilling/well construction method may occur adjacent to Tulpehocken Creek, where an increased overburden thickness may result in the water table being encountered above bedrock. In this case, a 2-inch-diameter PVC well will be constructed in the well boring, screened across the water table. Well screens will be 5 to 10 feet in length, with a 0.020-inch slot size. An appropriately sized sand pack will be emplaced around the screen, a bentonite pellet seal set above the sand pack and allowed to hydrate, then the remainder of the annulus will be backfilled with a cement-bentonite grout, emplaced using a tremie pipe. The installation of 6-inch-diameter steel temporary casings may be required in overburden well borings, to prevent caving of the borehole sides during the PVC well installation process. The temporary casing will be removed after well installation is completed. Protective casings with locking caps will be installed around each PVC well. Locking caps will also be installed on the steel casings for open borehole wells (see Figure 4-1).

Medium depth and deep monitoring well borings will, as described previously, be drilled using air rotary or air hammer drilling methods. For medium depth wells, 6-inch-diameter steel casing will be set to a depth of 55 feet and grouted in place to seal off shallow flow zones. After the grout is allowed to set up overnight, the boring will be continued until a water-yielding fracture zone is encountered. The boring will then be terminated and left as an open borehole well. Deep wells will be drilled in a similar manner, except that 6-inch steel casing

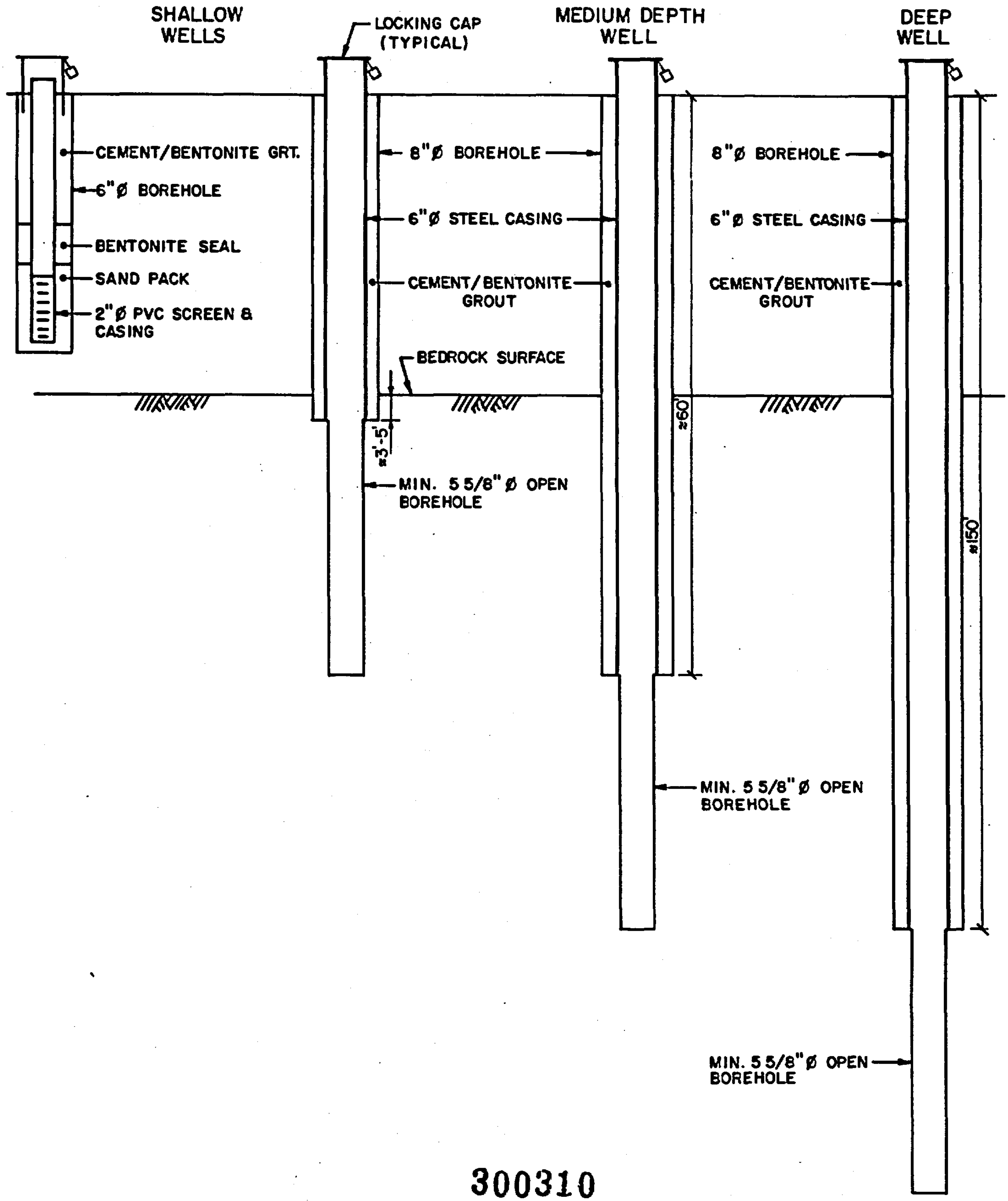


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FIGURE 4-1

PROPOSED WELL CONSTRUCTION DETAILS
WHITMOYER LABORATORIES SITE, MYERSTOWN, PA

NUS CORPORATION

will be set to a depth of 150 feet, with the boring extending below this depth.

All wells will be surveyed upon completion of the drilling/well installation program to determine vertical elevations and horizontal locations.

A complete log of each boring drilled will be maintained, describing lithologies, fracture depths and approximate water yields, depths of geologic contacts, total depths, and any other pertinent information that may be identified. A well construction diagram will be completed for each monitoring well.

Monitoring wells will be developed after installation to remove fines and sediments from around the well screens and to remove drill cuttings and residual drilling fluids from the area around the monitored interval of the boring. Wells will be developed by air lift, bailing and surging, or by pumping, as determined by the field geologist. Development water disposal will be in accordance with local and state requirements as determined through discussions with EPA.

Monitoring wells will be used for aquifer testing to determine the groundwater flow conditions in the water-bearing zones investigated by each well. The data generated from these tests will be used to define the water-yielding characteristics of each fracture zone, to develop groundwater velocity values, and to estimate the rate of groundwater movement across and away from the site. Slug tests or short-term pumping tests will be performed in the selected monitoring wells. Slug tests will provide localized data regarding the hydraulic conductivity of the screened/open interval of each well, while pumping tests (if performed) will provide data regarding the hydraulic characteristics of the bedrock aquifer on a larger scale and may illustrate surface water/groundwater interactions. Test results will be evaluated using the most appropriate evaluation technique for each type of test and for each individual set of hydrogeologic conditions. Pressure transducers and data loggers will be used for data collection, where appropriate, to obtain the most accurate field data possible. It is anticipated that each new monitoring well will be tested. Requirements to containerize pumped water may preclude the performance of pumping tests.

At least two complete rounds of water levels, taken at least 4 to 8 weeks apart, will be obtained from the new and selected previously existing monitoring wells and from staff gauges installed as part of the study. Staff gauges will be installed directly above, adjacent to, and downstream of the site along Tulpehocken Creek, within the canal adjacent to the site, and within surface water bodies located adjacent to offsite monitoring wells (ponds located adjacent to well locations MW-205, MW-207, and MW-208). All measurements for each collection round will be collected within a 24-hour period of consistent weather conditions to minimize atmospheric/

precipitation effects on groundwater conditions. Measurements will be taken with an M-scope (electrical water-level indicator) or popper, using the top of the well casing as the reference point for determining depths to water. Water-level measurements will be recorded to the nearest 0.01 foot. Groundwater contour maps will be developed to determine groundwater flow directions.

Sampling and analysis of groundwater will be conducted for new and selected existing monitoring wells. Two rounds of monitoring well sampling are proposed. The proposed analyses and total number of samples is summarized in Section 4.4. The methodology to be followed for groundwater sampling is described below:

- Wells will be purged prior to sampling.
- Field pH, Eh, temperature, conductivity, and dissolved oxygen measurements will be taken.
- Samples will be collected using a dedicated stainless-steel bailer.
- Samples will be handled, packaged, documented, and shipped according to EPA protocol.

Additional details regarding groundwater sampling are described in the FSAP.

<u>Test Boring Drilling/Sampling</u>

Test borings will be drilled both on and off site at selected locations according to the investigation plans described in Section 3.3. The test borings will be used to provide subsurface soil samples for chemical analysis, to determine whether soils are a significant potential source of groundwater contaminants, and to determine the approximate extent of contaminated soils for use in evaluating feasibility study alternatives which may include soil excavation/treatment/disposal. Detailed descriptions of test boring activities, including boring locations and the rationale for the borings, are provided in the various investigation discussions presented in Section 3.3. This section describes the methodology to be used in drilling and sampling test borings.

Test borings will be drilled using hollow stem augers. While hand augers were considered, hollow stem augers provide a more representative sample. Also, the depth of some soil borings could preclude hand augers. Borings will be extended to bedrock, then terminated and backfilled. Soil samples will be obtained continuously throughout the total depth of each boring, using large-diameter (3-inch O.D.), split-barrel samplers. Samplers will be decontaminated between each use, as specified in the FSAP.

One or two subsurface samples will be obtained for chemical analysis from each non-source-related test boring. One sample will be submitted for analysis from test borings which encounter bedrock at depths of 6 feet or less. Two samples will be submitted from test borings which encounter bedrock at depths of greater than 6 feet. In each test boring, a soil sample from directly above bedrock will be analyzed. In those borings where a second sample is to be analyzed, the second sample interval will be selected from the samples obtained at shallower depths, based on field conditions observed. Samples will be analyzed for the parameters described in Section 4.4.

Two subsurface samples will also be obtained for chemical analysis from source-related test borings. In those borings where wastes are encountered, the sample(s) will be taken from the waste interval(s) encountered. If no wastes are encountered, the sampling depths will correspond to the procedure described for non-source-related test borings.

Thin-walled (Shelby) tube samples are required from selected test borings drilled into the consolidated lagoons. These samples will be obtained from selected depths as specified in Section 4.3.2.3 according to standard sampling procedures for thin-walled tube samples (ASTM D-1587).

Upon completion of drilling and sampling activities, test borings will be backfilled using drilling cuttings, with any excess void space backfilled using bentonite chips. An effort will be made to replace drilling cuttings to the approximate depths that they originated from. A layer of bentonite, approximately 1 foot thick, will be emplaced in the bottom of selected test borings, (in the consolidated and excavated lagoons area) prior to backfilling. Test borings will be logged in detail by the field geologist.

Downhole drilling equipment will be decontaminated between boreholes, by steam cleaning. Split-barrel samplers will be decontaminated between each use, using deionized water and methanol, as described in the FSAP.

In addition to the one to two samples obtained from each test boring, a surface soil sample will be collected from the 0- to 3-inch depth interval at each boring location. The surface soil sample will be obtained using a stainless-steel trowel, which will be decontaminated between each use as described in the FSAP.

Prior to drilling each test boring on site, facility maps will be examined and a metal detector survey performed to determine whether any buried lines are located in the vicinity of the proposed test boring. Boring locations will be adjusted as necessary to avoid hitting underground lines.

Test Pit Excavation/Sampling

Test pits will be excavated at selected locations on site, as described in the individual investigations presented below. The test pits are to be excavated in suspected waste disposal areas, in order to provide visual evidence of waste disposal activities and to obtain soil/waste samples for chemical analysis. Test pits have been proposed for investigating potential burial sites wherever possible, as the test pits provide the clearest and largest scale picture of actual subsurface conditions of the most commonly used investigative techniques.

Prior to excavating each test pit on site, facility maps will be examined and a metal detector survey performed to determine whether any buried lines are located in the vicinity of the proposed test pit. Pit locations will be adjusted as necessary to avoid hitting underground lines.

A backhoe will be used to excavate test pits at the selected locations. Test pits will be extended vertically to bedrock, to natural soils underlying waste deposits, or to the maximum reach of the backhoe (approximately 15 feet). The lateral extent of each test pit will be determined in the field based on observations made during excavation activities. Two or three samples will be obtained from each test pit excavated, at depths/locations determined in the field based on observed subsurface conditions. Waste deposits, discolored soils, or soils which contain volatile organics as evidenced by elevated readings on portable organic vapor detector instruments will be targeted for sampling. Samples may be obtained either from soils contained in the backhoe bucket or directly from the test pit itself (if the test pit does not exceed 4 feet in depth at the time of sampling). The samples obtained will be analyzed for the parameters listed in Section 4.4. The backhoe bucket will be decontaminated by steam cleaning between test pits.

Each test pit excavated will be logged by the field geologist prior to backfilling. Included in the log will be descriptions of soils and wastes encountered, sampling depths, and the total depth of each pit. After excavation, sampling, and logging activities are completed, each test pit will be backfilled using the excavated soils. A layer of bentonite, approximately 1 foot thick, will be emplaced in the bottom of selected test pits (in the excavated lagoon area) prior to backfilling with soils. Excavated soils will be replaced into the same depth intervals as they originated from, to the extent possible.

4.3.2.2 Vault Characterization

The primary objectives of the vault investigation are to better define waste concentrations inside of the vault, determine the effectiveness of the vault seal, measure the effect on the environment if the vault seal is not intact, and, if warranted, demonstrate treatment options for the vault contents. The specific data objectives from the proposed vault investigation

300314

are listed in Section 3.3. Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4.

To collect samples for waste concentration analyses, hazardous waste determination, and treatability testing, if warranted, the vault contents will be sampled. To obtain the samples from the vault wastes, a drilling rig will be backed up to the edge of the vault and two borings will be drilled into the vault wastes. Two samples will be collected for chemical analysis per hole, one from above the calcium arsenate sludge horizon (expected to consist of contaminated dirt and leakage from the aniline still bottom drums) and one from the calcium arsenate sludge itself. Samples for chemical analysis will be homogenized in a stainless steel mixing bowl prior to placement in the appropriate sample containers. Bulk samples for treatability testing will be collected at the same time and stored appropriately. Treatability studies are discussed in Section 4.7 of this Work Plan.

To determine the effectiveness of the vault seal, a well point will be installed in the northwest corner of the vault. The northwest draw tube had the largest water level fluctuation of the four draw tubes when measured by WLI. Additionally, four monitoring wells (MW-100A, MW-100B, MW-101A, and MW-102A) will be installed at three locations around the vault perimeter (see Figure 3-1). Installation of these monitoring wells is discussed in Section 4.3.2.1 above.

Water level measurements will be taken three times per week for 3-4 weeks using the well point, monitoring wells, four draw tubes, and the Kohl Brothers (vault) borehole, to attempt to establish a correlation (or lack of) between groundwater level fluctuations and fluid level fluctuations within the vault. If the water level in the well point correlates well with the external water levels, this will serve as a good indication that the vault seal is ineffective.

Additionally, a tracer (lithium) will be introduced into the well point. If the tracer is detected in the shallow downgradient monitoring wells (sampled weekly), the vault seal will be considered ineffective. Demonstration of the vault seal's effectiveness or ineffectiveness is important for cost recovery and risk assessment purposes.

Finally, two rounds of samples for chemical analyses will be collected from the monitoring wells. Contaminant concentrations in apparent upgradient wells and apparent downgradient wells will be compared to indicate if the vault is contributing contaminants to groundwater.

Three soil borings will be drilled adjacent to the monitoring wells and sampled. Soil boring drilling and sampling techniques are discussed in Section 4.3.2.1. The reason soil borings are being excavated adjacent to the monitoring wells is that the monitoring well drilling technique is not conducive for soil sampling. It was determined to be more cost-effective to drill soil borings adjacent to the monitoring wells rather than adapt the monitoring well installation method.

Two or three samples will be collected per boring, depending on the soil layer thickness. The first sample will be collected at a depth of 0-3 inches to provide an estimate of contaminant concentration in the upper layer of soil. The upper soil layer could serve as a source for inhalation/ingestion, dermal contact, and/or soil runoff to Union Canal.

A second sample will be collected from the soil at the soil-bedrock interface. If the soil thickness is greater than 6 feet, a third sample will be collected somewhere in between the soil surface and bedrock, at the geologist's discretion, based on visual observation and screening with an HNU PI-101 portable air monitoring photograph ionization detection instrument.

Volatile contaminant concentrations in air will be monitored while work is occurring near the vault. Volatile organic levels will be measured in the breathing zone using an OVA and/or an HNU.

4.3.2.3 Consolidated Lagoons Characterization

The primary objectives of the consolidated lagoons investigation are to better define contaminant concentrations inside the lagoons, including spatial variation; determine the lagoon contents contribution to groundwater; determine the permeability of the lagoon cap, sludge, and liner; determine the lagoon's consolidation and strength characteristics; and demonstrate treatment options for the lagoon content, if warranted. The specific data objectives and the overall investigation approach for the consolidated lagoons investigation are described in Section 3.3.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4.

To define contaminant concentrations in the lagoons, one soil boring per lagoon will be drilled, with continuous split-barrel sampling performed throughout the total depth of each boring, as described in Section 4.3.2.1. The soil boring locations are shown on Figure 3-2.

One surface soil sample will be collected from each boring location at a 0- to 3-inch depth for chemical analysis. A second sample will be collected from the former western lagoons sludge. This sludge, which was excavated and placed on top of the original eastern lagoons sludge, should be distinguishable by the presence of admixed soil and rocks. The third and last sludge chemical analysis sample will be collected from the original eastern sludge material. This material should be at the lagoon bases and relatively free of soil and rocks.

One subsurface sample from each boring will be submitted for a full scan of TAL and TCL (BNA and VOA) analytes. The determination of which sample will be submitted for full analysis will be made in the field by the geologist, based on visual evidence of contamination and HNU screening. If no sample intervals are visually different or emit organic odors detectable with an HNU, the sample to be submitted for full scan analysis will be decided by the geologist.

Four samples of the lagoon capping material will be collected and tested for permeability. The sampling team will attempt to collect these samples in thin-walled (Shelby) tubes. If this is successful, the sample will be analyzed for unit weight/water content (ASTM D 2216-80), grain size distribution (ASTM D 422-63), specific gravity (ASTM D 854-3), Atterberg limits (ASTM D 4318-84), and triaxial permeability (EPA Method 9100.2.8, SW-846). If a Shelby tube sample cannot be collected or pushed properly, in-place density and water contents will be determined using a nuclear densometer (ASTM D 2922-81). After the in-place density and water content are known, a sample will be prepared to the average field density in the laboratory and submitted for triaxial permeability testing. Once these test results have been received, estimates of the in-situ permeability will be derived and applied to the conceptual model for the consolidated lagoons.

Four subsurface sludge (with possible intermixed soil) samples will be collected for strength, consolidation, and permeability characteristics testing. The strength and consolidation characteristics tests will be performed to allow an engineering determination of whether the lagoon sludge will support a RCRA-type cap if this remedial alternative is deemed appropriate. The permeability tests will be conducted to provide an estimate of the subsurface sludge material's permeability. This estimate will serve as input to the consolidated lagoons conceptual model.

If Shelby tube samples can be secured from the subsurface sludge samples, the samples will be subjected to unit weight/water content, one-dimensional consolidation (ASTM D 2435-80), unconfined compressive strength (ASTM D 2166-66), grain size distribution, and specific gravity tests. If Shelby tube samples cannot be obtained, drive samples will be subjected to water contact, grain size distribution, Atterberg limit tests, and specific gravity tests. In both cases, engineering estimates of permeability and bearing capacity will be made from the test results.

The sample team will also attempt to collect four Shelby tube samples of the liner material. If this is not possible, drive

300317

samples will be collected. Shelby tube samples will be subjected to unit weight/water content, grain size distribution, specific gravity, and triaxial permeability tests. Drive samples will be subjected to grain size, Atterberg limits, and specific gravity tests. Liner permeability will be estimated based on the test results.

Any liner material excavated will be replaced with 1 foot of bentonite, so that the lagoon will be left in as good a condition as when the drilling commenced.

The permeability test data will serve as inputs into a vadose zone conceptual model to be used for estimating the consolidated lagoon's contaminant contribution to groundwater. Additional model inputs include precipitation (P), evaporation (E), and transpiration (T). These inputs will be estimated from pertinent literature.

Another necessary model input is lagoon content leachability. To measure this, four vacuum pressure lysimeters will be placed in the sludge within the lower portion of the lowest sludge layer. Lysimeters will have a porous teflon intake section with a lower PVC storage section. The lysimeters will be installed at the selected depths within each designated borehole. The installation procedure will consist of backfilling each borehole to within approximately 3 feet of the desired sampling interval, using bentonite powder. The lysimeter will then be suspended in the boring at the appropriate depth and a silica flour slurry placed around the lysimeter and to 3 feet above the lysimeter intake. The remainder of the boring will be backfilled with bentonite, to provide a competent seal (see Figure 4-2). These lysimeters will be sampled twice for chemical analysis.

A split of the eight lagoon samples subjected to the full-scan chemical analysis will also be submitted for TCLP metals analysis. The TCLP test will be primarily used to determine if the lagoon sludge is a "hazardous waste" under RCRA regulations. The test results will also be used to evaluate the sludge's leachability. The TCLP test is typically conducted at a pH near 5. This pH is within one pH unit of the expected pH for infiltrating rainwater. However, the pore water pH could be affected by the lagoon sludge or the underlying carbonate bedrock. The solubility of ferric arsenate is known to be pH dependent. The applicability of the TCLP test for estimating leachability will be evaluated once the analytical data are received.

Five test borings will be drilled and sampled to bedrock around the perimeters of the consolidated lagoons. The boring locations are shown on Figure 3-2. These holes will be drilled to confirm the areal extent of the lagoons and to provide soil contaminant concentration information for soil surrounding the lagoons. Section 4.3.2.1 describes test boring drilling/ sampling procedures.

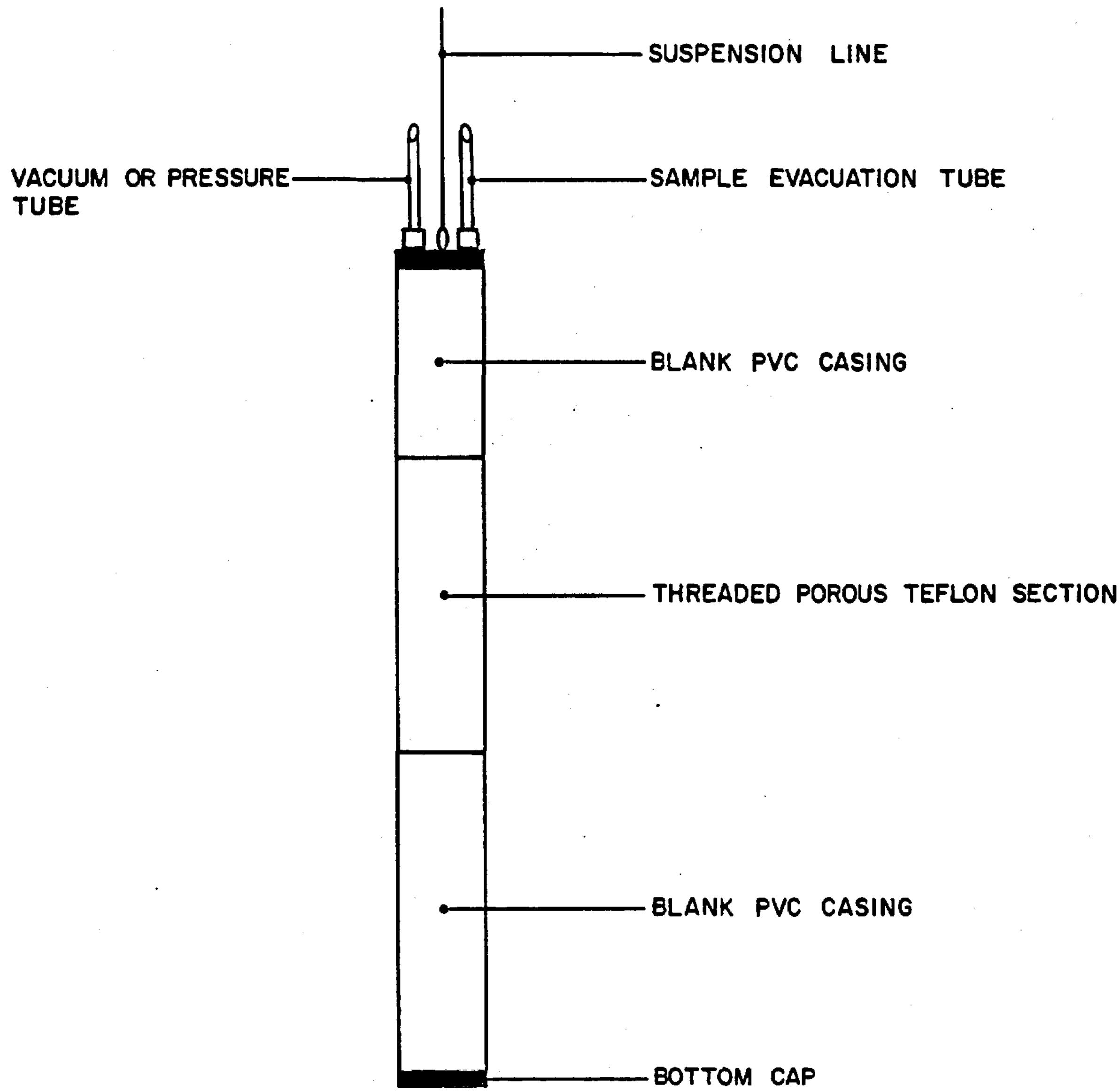

FIGURE 4-2

TYPICAL LYSIMETER CONSTRUCTION
WHITMOYER LABORATORIES SITE, MYERSTOWN, PA
N. T. S.

NUS CORPORATION

300319

Two or three samples will be collected from each of the borings, depending on soil thickness. Regardless of soil-thickness, samples will be collected from the 0- to 3-inch interval and from soil just above bedrock. If the soil thickness is greater than 6 feet, a third sample will be collected from an interval somewhere between a depth of 3 inches to 6 feet at the geologist's discretion, based on visual observations and HNU readings. A total of 13 soil samples has been estimated for budgeting and scheduling purposes.

Four monitoring wells (MW-106A, MW-107A, MW-107B, and MW-107C) will be installed around the lagoon's perimeter, as shown on Figure 3-1. Drilling installation, and sampling of these wells is discussed in Section 4.3.2.1. Two rounds of chemical analyses will be collected from the lagoon wells. Contaminant concentrations in apparent upgradient and downgradient wells will be compared to indicate if the lagoons are contributing contaminants to groundwater.

4.3.2.4 Excavated Lagoons

The primary objectives of the excavated lagoons investigation are to determine if any sludge has remained in place after the lagoon excavation, to determine if the former lagoons operation led to soil contamination adjacent to the lagoons, and to determine if residual contamination, if any, at the excavated lagoon site is leading to groundwater contamination. The specific data objectives for the excavated lagoon investigation are listed in Section 3.3. The overall approach proposed to investigate the excavated lagoons is described in Section 3.3. Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4.

As stated previously, reports in WLI's files and from former employees indicate that nearly all of the sludge once present in the western lagoons has been excavated and placed on top of the eastern lagoon sludge. To confirm these reports, a combination of fourteen test borings and test pits (two per lagoon) will be advanced to bedrock, and visually inspected for the presence of sludge by the oversight geologist. Additionally, two or three soil samples, depending on soil depth, will be collected from one of the two test pit or test boring locations per lagoon. The first sample, from a 0- to 3-inch depth, will be taken to provide surficial soil concentration information for evaluating the inhalation/ingestion, dermal contact, and surface runoff pathways. The second sample will be collected from soil (or sludge) at the soil-bedrock interface. This second sample will be collected to determine the sludge (if present) contaminant concentrations, or to determine if soil at the bedrock-soil interface contains an elevated level of contaminants. Finally, if the lagoon fill is greater than 6 feet thick, a third sample will be collected from each test pit or test boring from somewhere between the 3-inch depth and the 6-foot depth at the geologist's discretion, based on visual observation and HNU

300320

readings. This last sample will be biased to identify the maximum amount of contamination in the test pit. If no unusual intervals are identified during the drilling, the third sample will be collected from an interval selected by the geologist. Test pit excavation/sampling techniques and test boring drilling/sampling techniques are discussed in more detail in Section 4.3.2.1.

Test pits will be excavated at all sampling locations outside of the Buckeye Pipeline property, while test borings will be drilled inside the property, to minimize soil disturbance in this area.

Three test pits will also be excavated around the lagoon perimeter, to determine if there is any residual sludge beyond the former lagoons' boundaries or if soil concentrations have become elevated due to proximity with the former lagoons. Although test pits create more soil disturbance than borings, test pits were selected here because of the greater amount of subsurface information they will provide. Similar to the lagoon test pits, two or three soil samples will be collected, based on the soil thickness. The first sample, from a 0- to 3-inch depth, will be taken to provide surficial soil concentration information for evaluating the inhalation/ingestion, dermal contact, and surface runoff pathways. The second (and third) samples will be collected to provide subsurface soil contaminant concentrations to be used in estimating the amount of contaminant in the soil possibly available to groundwater.

Finally, three monitoring wells (MW-103A, MW-103B, MW-104) will be installed around the perimeter of the former lagoons (see Figure 3-1). Drilling, installation, and sampling of monitoring wells is described in Section 4.3.2.1. The wells will provide groundwater quality and water-level information for the northwest portion of the site, and could detect the contribution of contaminants to groundwater from residual sludge or soils contamination if present.

If significant amounts of sludge (or heavily contaminated soil) are found at the former lagoons' location, the need for additional efforts will be evaluated. If further characterization is needed, this work will be conducted during a later phase of the RI.

4.3.2.5 Process Buildings

The primary objectives of the process building investigation are to determine if accumulations on the buildings and equipment surfaces present a threat to human health; to determine if atmospheric concentrations of volatile organics, arsenic, and asbestos inside the buildings pose a threat to human health; to determine if roof runoff during rain and snow melt events can possibly degrade surface water; to determine whether soil contaminant concentrations near and under the buildings are elevated from past operations; and to determine if past operations at the buildings (including wastewater injection into well No. 4) has contributed contaminants to groundwater. The specific data objectives for the process building investigation are listed in Section 3.3.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4 below.

The condition of the process buildings presently is largely unknown. Due to health and safety concerns, the buildings were examined from outside and not entered during the site visits. When the door to Building 1 was opened, a strong organic odor was noticed. Additionally, many full laboratory containers were visible through the windows of Buildings 2 and 8.

One building, Building 18, is presently being used as a food warehouse. This building will be excluded from the field investigation, as it is the subject of review of other regulatory agencies. This building, the newest on site, was only used as a warehouse by WLI.

There is a concern that residual chemicals from production and storage may be present in the remaining buildings, both in the vapor and particulate form. Additionally, residual liquids from production may be present in the process equipment and piping. Finally, there may be full containers (drums, etc.), in addition to the laboratory containers, present in the buildings. Human exposure from inhalation/ingestion and direct contact is possible.

The first process building task is initial entry into the buildings to set up air monitors. This initial data collection, which is discussed in more detail in the Whitmoyer Laboratories Site RI/FS Health and Safety Plan (HASP), will be used to establish the level of worker protection when work is performed in the buildings. Data from this exercise will also be used when evaluating the "no-action" alternative for the buildings.

The buildings of primary concern from a health and safety viewpoint are Buildings 1, 2, 3, 5, 6, and 7. The reason for this concern is that neither aniline, which was used in Buildings 1, 2, 3, 6, and 7, nor methyl bromide, which was used in Building 5, can be filtered from the air using chemical respiratory cartridges. Therefore, gaseous concentrations of these chemicals will be monitored in the buildings where they are suspected.

To monitor the aniline and methyl bromide gaseous concentrations in the air, a metered volume of gas from the buildings will be drawn across silica gel and charcoal sorbent media tubes, which have been selected for their affinity for methyl bromide and aniline at the site, respectively. Two tubes of sorbent media will be linked in series to evaluate breakthrough from the first tube in the series. Following sample collection, the sorbent media tubes will be shipped off for immediate analysis. Tables of breakthrough values are available for aniline and methyl bromide from the sorbent suppliers; if the concentration in the first tube when analyzed approaches a breakthrough value, the second tube will be analyzed. Once the analytical results are available, the Health and Safety Officer (HSO) will determine the level of protection necessary for the workers.

Other organic chemical vapor concentrations in the building air will be monitored with an HNU. This information will also be used in establishing safe worker protection levels. Additionally, these qualitative data will be used in the exposure assessments for the buildings.

Once the worker protection level has been established, the buildings will be inventoried. Room conditions, including presence of equipment, piping, residual liquids, containers, buildup of dust or grime on surfaces, asbestos, and any special conditions will be noted. Additionally, the quantity of each type of building material, e.g., concrete block, will be estimated. Finally, maps showing the general building layouts and key features will be prepared immediately after this inventory to facilitate future efforts in the buildings.

Wipe samples will be collected from the inner surfaces of roofs (or ceilings), walls, and floors of rooms suspected of being contaminated. Generally, one wipe sample from the roof, floor and wall each will be collected per suspected room.

Since it has not been possible to inventory the buildings, the total number of building wipe samples to be collected is not known with certainty. An estimate of 100 samples has been derived for budget and schedule purposes.

Wipe samples will be collected with Whatman 541 filter paper or equivalent for metals samples and glass fiber pads for BNA samples. The sample will be collected by rubbing moistened filter paper over a 100-square-centimeter area. Water will be used for moistening metals samples and a 1:4 acetone/hexane mixture used for BNA samples. Once the samples are collected they will be placed in clean sample containers and shipped for analysis.

The analytical results will be related back to the known area of the sample. In this way the results can be converted to units such as µg/square centimeter. The converted results can then be used as input for modeling exposure for building occupants.

Six wipe samples will be collected from the outer building surfaces directly adjacent to building exhausts. These sites have been known to accumulate elevated concentrations of contaminants at other sites. The same protocols will be followed as for inner building surface wipe samples.

Wipe samples will also be collected from pieces of equipment in the buildings. To reduce the number of samples, wipe samples will be composited from several pieces of equipment in a general area where practical. As for the building surface samples, a 100-square-centimeter surface area will be wiped per sample. Water will be used for moistening the filter paper for metals samples, while a 1:4 acetone/hexane mixture will be used for BNA samples. Similarly, once the samples are collected, they will be placed in clean sample containers and shipped for analysis.

The analytical results from the equipment wipe samples will also be related back to the known area of the sample, to permit modeling the exposure for building occupants.

Since the buildings have not been inventoried, the exact number of equipment wipe samples has not been established. An estimated 50 equipment wipe samples, exclusive of QA/QC samples, has been estimated for budgeting and scheduling purposes.

Possible asbestos ceiling materials were noted during the previous site visits. These materials may be releasing asbestos fibers to the building air, creating a potential health threat. To evaluate this potential threat, a REM III asbestos expert will inventory the building materials and piping coating. Additionally, bulk samples of suspected asbestos material will be collected for analysis.

Bulk samples of the ceiling materials will be collected with a small coring device. Bulk samples of piping material will be collected using forceps. Sample locations will be wetted prior to sample collection to limit dust generation. The sample areas will be repaired using putty or an encapsulant following sampling.

The samples will be analyzed using polarized light dispersion staining. The sample analysts will follow EPA protocols for asbestos analysis. Details on the sampling and analytical methods are contained in the FSAP.

If many rooms and/or piping materials are suspected of containing asbestos, only a representative subset of the materials will be tested. Ten samples are estimated for budgeting and scheduling purposes.

In addition to the original atmospheric measurements, volatile organic levels will be measured periodically using an HNU. Although this information will be primarily used for insuring that the worker protection level selected remains appropriate, this qualitative data will also be available for the exposure assessment.

To determine if residual liquids remain in the piping, piping valves will be opened. If liquids are present they will be collected in drums and sampled. Fifty piping liquid samples have been estimated for budgeting and scheduling purposes. The sample team will attempt to refine this number early in the building investigation to allow laboratory scheduling.

WLI company files indicate that roof runoff from the Building 1-7 complex commonly contained elevated levels of arsenic when sampled in the late 70s. To determine if this situation is still occurring, water coming from the roof drains will be sampled during a rain event. No criteria for the rain event, e.g., greater than 1 inch, will be specified. The samples will be considered representative if the water coming from the roof drains is due to precipitation. Key data regarding the sampling, e.g., total amount of rainfall, total amount prior to sampling, length of time from the start of rain until the sampling time, will be recorded in the field logbook. The number of roof drains at the site is presently unknown. A total of 7 roof drain samples has been estimated for budgeting and scheduling purposes.

In the unlikely event that it does not rain sufficiently to cause roof runoff while the sampling team is in the field, artificial roof runoff samples will be created by hosing down the roofs with Myerstown municipal water. This water is tested frequently and contains relatively little, if any, contaminants. To determine the arsenic contribution from the municipal water (and hose apparatus), a field blank will be collected by filling clean sample bottles directly from the hose during the sampling event.

In order to properly dispose the laboratory wastes on site, a subcontractor will be procured to segregate and drum wastes that are compatible and have similar disposal characteristics, e.g., high volatile organic content. To ensure compatibility, wastes will be analyzed in the field. Wastes will also be segregated based on halogen content. For example, flammable non-halogen wastes will be combined and segregated for potential treatment in an offsite incinerator. If halogenated wastes were to be combined with non-halogenated wastes, the combined wastes may have a chloride content too high to make incineration feasible.

Once drums of similar compatible wastes have been filled, they will be sampled by the subcontractor, with REM III assistance. The samples will be analyzed for parameters necessary to evaluate disposal options for the wastes, e.g., BTU content.

An estimated 100 drums of laboratory wastes will be filled. The sample team will attempt to refine this number early in the building investigation to allow laboratory scheduling.

There is a concern that the process operations area has elevated soil contaminant concentrations near the buildings. To test this hypothesis, three test borings will be drilled/sampled adjacent to the buildings. The boring locations are shown in Figure 3-2. The drilling/sampling of test borings is discussed in more detail in Section 4.3.2.1.

300325

Two or three soil samples will be collected per boring, depending on the soil thickness. For the borings, a surface sample will be collected from the interval of 0-3 inches. These samples will be used to evaluate surface runoff, inhalation/ingestion, and dermal contact risk.

Subsurface soil samples will be collected and analyzed to determine subsurface soil contaminant concentrations. This data will be used in estimating the amount of contaminants in the soil available to leach into groundwater. One or two samples will also be collected, depending on the depth to bedrock. A subsurface sample will be collected from each boring at the soil bedrock interface. If bedrock is at a depth greater than 6 feet, a second subsurface sample will be collected from the interval below the depth that the surface sample was collected and above a depth of 6 feet. The sample interval will be specified by the geologist, based on visual observation and HNU readings. This last sample will be biased to identify the maximum amount of contamination in the interval. If no unusual soil layers are identified during the drilling, the third sample will be collected from an interval selected by the geologist.

Three monitoring wells (MW-112A, MW-116A, and MW-118A) will be installed adjacent to the process buildings, as described in Section 3.3.5, to provide water quality samples for determining whether the process buildings are impacting local groundwater. Additionally, four monitoring wells (MW-115A, MW-114A, MW-113A, and MW-113B) will be drilled along the eastern WLI boundary, near the process buildings. Monitoring well drilling/installation/sampling is described in Section 4.3.2.1.

The results of the process building investigation cannot be predicted at this time. If the results indicate that future investigatory efforts are necessary beyond the scope of this Work Plan, the need for these efforts will be assessed. One possible scenario is that the building materials themselves may require testing to appropriately identify decontamination or disposal options.

4.3.2.6 Drum and Tank Investigation

The primary objectives of the drum and tank investigation at the Whitmoyer Laboratories Site are to estimate the number of full and partially full drums being stored there, to develop disposal options for the non-empty drums, to determine if any of the tanks on site contain liquids or sludges, and to chemically and physically characterize the liquids or sludge present. The specific data objectives for the drums and tanks investigation are listed in Section 3.3.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4.

Apparently 600 full and partially full drums are being stored on site presently. The majority of these drums are reportedly well marked regarding their origin (as opposed to their chemical contents) and contain approximately 65 different types or groups of materials. A former WLI employee reported that all of the drums marked with the same originating waste stream should be relatively homogeneous. Additionally, approximately 45 drums of unknown origin are reportedly present on site.

The first part of the drum sampling program involves determining if the drums marked as coming from the same waste stream are relatively homogeneous. To determine if this is the case, several samples from different drums marked with the same waste stream will be collected and compared in the field, using simple tests such as halogen presence, headspace, pH, and visual observation. It is expected that drums marked as coming from the same waste stream will be relatively homogeneous. If this is not the case, the drum sampling program will be modified, after discussions with EPA.

Once the homogeneity of similarly marked drums has been established, samples of drums from each waste stream and each unknown drum will be subjected to field compatibility testing. These tests will be conducted to segregate the drums into categories, e.g., low halogen, water-insoluble liquids, or water-reactive solids. These categories will be selected based on compatibility and disposal options. It is estimated that as many as 30 categories will be necessary to describe the nearly 600 drums onsite. Categorization of drum materials will be based on the protocols described in "Guidance Document for Cleanup of Surface Tanks and Drum Sites," (EPA, 1985b).

Once the drum types have been categorized, representative samples will be collected from each category. To do this, aliquots from each waste type or drum will be combined, based on volume, into a sample considered representative of the category. For example, if one of the categories consists of 6 methanol still bottom drums, 3 butanol still bottom drums, and 1 drum of unknown content, the sample will consist of 6 parts methanol still bottom drums, 3 parts butanol still bottom drums, and 1 part from the unknown drum. These aliquots will be combined into samples for offsite laboratory analysis.

No physical movement of the drums will occur unless dangerous conditions exist. A drum grappler will be used for moving drums; overpack drums will be available if needed.

Samples from drums containing liquids will be obtained with glass tubes, while solid samples will be collected with stainless steel spoons or another appropriate sampling device. In addition to chemical quality parameters, selected parameters, e.g., BTU content, will be analyzed in the laboratory to permit evaluation of drum disposal options. A total of 150 drum samples for field analyses and 30 samples for laboratory analyses has been estimated for budgeting and scheduling purposes.

The condition of each tank on site will be established using a glass tube or other appropriate sounding device. The approximate volume of liquids (and sludge) in each tank, if any, will be calculated. Following this, all of the non-empty tanks will be sampled using glass tubes or another applicable sampling device. A total of 10 tank samples has been estimated for budgeting and scheduling purposes.

The locations of the drums and tanks on site as of the January 1988 site visits are shown on Figure 2-5.

4.3.2.7 Waste Pits (Buildings 6, 9, and 11)

The main objective of the waste pits investigation is to determine if a "hot spot" of residual soil contamination which could act as a source for groundwater degradation is present at the sites of the former and present waste pits. The specific data objectives for the waste pits investigations are listed in Section 3.3.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4.

Since it is presently unknown if any residual soil contamination remains at the sites of the former and present waste pits, the waste pit investigation will essentially be a screening investigation. Soil adjacent to the former (Buildings 9 and 11) waste pits will only be sampled at one location per pit, while two locations will be sampled adjacent to the Building 6 (Department 8101) waste pit (see Figure 3-3). If this soil is found to contain elevated contaminant concentrations, the need for future work beyond the scope of this Work Plan will be assessed.

To perform depth-integrated soil sampling adjacent to the waste pits, a test pit will be excavated to bedrock at each of the four sample locations. Although test pits create more soil disturbance than borings, test pits were selected here because of the greater amount of subsurface information they will provide. Since the former waste pit locations are known only approximately, the sample team will be better able to sample adjacent to the pits by using a backhoe rather than test borings. Since the former waste pits are no longer used and should not contain liquid wastes, there is no concern about damaging the cinder block walls. On the other hand, the sample team will use caution so as to not disturb the Building 6 (Department 8101) waste pit, which was being used when the facility closed. Test pit excavation techniques are discussed in detail in Section 4.3.2.1.

Two or three samples from each test pit location will be collected. The first sample, from a 0- to 3-inch depth, will be taken to provide surficial soil concentration information for evaluating the inhalation/ingestion, dermal contact and surface runoff pathways. The second (and third) samples will be collected from subsurface sample intervals determined by the geologist based on visual observation and HNU readings. These samples will be collected to provide subsurface soil contaminant concentrations to be used in estimating the amount of contaminant in the soil possibly available to groundwater. The subsurface samples will be biased to identify the maximum amount of contamination in the boring. If no unusual intervals are identified during the test pit excavation, one of the subsurface samples will be collected from the soil lying directly above bedrock.

To aid in the determination of contaminant leachability from the soil, as well as to determine if some of the soil could be considered "hazardous waste," one subsurface sample from every other boring will be submitted for TCLP analyses. The TCLP procedure is going to be used for hazardous waste determinations under EPA's RCRA regulations in the near future.

Two monitoring wells will be installed at one location adjacent to the cesspool adjacent to Building 11 (MW-109A and MW-109B), three wells will be installed at one location adjacent to the Building 6 cesspool (MW-117A, MW-117B, and MW-117C), and one well will be installed downgradient of the cesspool at Building 9 (MW-108). Multiple wells are proposed for the Building 6 and 11 cesspools, as these cesspools have been targeted as areas of particular concern and data regarding both the vertical extent of contamination and vertical groundwater gradients near the Union Canal and Tulpehocken Creek is required. Monitoring well drilling/installation/sampling is described in Section 4.3.2.1.

The Building 6 waste pit was full with liquids when the site was visited in January 1988. To assess the condition of this pit (and reduce the exposure threat to the workers on site), this pit will be pumped out. The pit water will be combined with well development water and disposed appropriately.

If significant contamination is found during the above-described waste pit investigation, the need for additional investigatory efforts will be assessed.

4.3.2.8 1951 Waste Pit

The probable pit (see Figure 3-3) identified in 1951 is suspected of containing buried waste materials, including fiber drums containing aniline still bottoms. The primary objective of the investigation of the 1951 waste pit is to determine if any buried wastes or "hot spots" of residual soil contamination are present in the probable pit vicinity. The specific data objectives for the 1951 waste pit investigation are listed in Section 3.3 above.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4 below.

Since it is presently unknown if any residual soil contamination remains at the sites of the probable 1951 waste pit, the waste pit investigation covered under this Work Plan will essentially be a screening investigation.

Following the site-wide soil-gas survey, three test pits will be excavated to bedrock in the pit vicinity using a backhoe. Although test pits create more soil disturbance than borings, test pits were selected here because of the greater amount of subsurface information they provide. Test pit excavation methodologies are discussed in detail in Section 4.3.2.1.

Two or three samples from each test pit location will be collected. The first sample, from a 0- to 3-inch depth, will be taken to provide surficial soil concentration information for evaluating the inhalation/ingestion, dermal contact, and surface runoff pathways. The second (and third samples) will be collected from subsurface sample intervals determined by the geologist based on visual observation and HNU readings. These samples will be collected to provide subsurface soil contaminant concentrations to be used in estimating the amount of contaminant in the soil possibly available to groundwater. The subsurface samples will be biased to identify the maximum amount of contamination in the boring. If no unusual intervals are identified during the test pit excavation, one of the subsurface samples will be collected from the soil lying directly above bedrock.

To aid in the determination of contaminant leachability from the soil, as well as to determine if some of the soil could be considered "hazardous waste," one subsurface sample from two of the test pits will be submitted for TCLP metal analysis. The TCLP procedure is going to be used for hazardous waste determinations under EPA's RCRA regulations in the near future.

Monitoring well MW-111A will be installed immediately downgradient of the waste pit (and the adjacent drum storage area) to provide groundwater quality data for this area. Monitoring well drilling/installation/sampling is described in Section 4.3.2.1.

If significant contamination is found during the above program, the need for additional investigatory efforts will be assessed.

4.3.2.9 Photographic Anomalies

Nine various site anomalies, e.g., rubble piles and unidentified debris, were located when previous aerial photography from the site was reviewed (see Figure 2-4). Residual contamination may be present at these sites.

The primary objective of the anomaly investigation is to determine if any buried wastes or "hot spots" of residual soil contamination are present in the probable pit vicinity. The specific data objectives for the photographic anomalies investigation are listed in Section 3.3.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4.

Since it is presently unknown if any residual soil contamination remains at the aerial anomalies sites, the investigation covered under this Work Plan will essentially be a screening investigation.

Two test pits will be excavated to bedrock at each site using a backhoe. Two or three samples from each test pit will be collected. The first sample, from a 0- to 3-inch depth, will be taken to provide surficial soil concentration information for evaluating the inhalation/ingestion, dermal contact, and surface runoff pathways. The second (and third) samples will be collected from subsurface sample intervals determined by the geologist based on visual observation and HNU readings. These samples will be collected to provide subsurface soil contaminant concentrations to be used in estimating the amount of contaminant in the soil possibly available to groundwater. The subsurface samples will be biased to identify the maximum amount of contamination in the boring. If no unusual intervals are identified during the test pit excavation, one of the subsurface samples will be collected from the soil lying directly above bedrock.

To aid in the determination of contaminant leachability from the soil, as well as to determine if some of the soil could be considered "hazardous waste," one subsurface sample per anomaly will be submitted for TCLP analyses. The TCLP procedure is going to be used for hazardous waste determinations under EPA's RCRA regulations in the near future.

Monitoring wells will be installed adjacent to selected anomaly areas. Monitoring wells MW-119A and MW-119B are located next to an area of standing liquid identified in a 1969 photograph and will provide water quality and water level data for the southwest area of the site. Monitoring wells MW-110A, MW-110B, and MW-110C are located adjacent to a disturbed area identified from 1963 photographs and will provide water quality and water level data (including vertical head distributions) for the southern area of the site. Well locations are shown on Figure 3-1. Monitoring well drilling/installation/sampling is described in Section 4.3.2.1.

If significant contamination is found during the above program, the need for additional investigatory efforts will be assessed.

4.3.2.10 Former DDAA Storage Areas

DDAA was reportedly stored on the surface at two locations on site during the early 1960s (see Figure 2-4). Reportedly this material was excavated and recycled. Soil underneath the DDAA piles was reportedly also excavated and placed in the vault. The arsenic and aniline contents of soil which remained in place were not specified. There is a concern that residual contamination could pose a threat via direct contact, inhalation/ingestion, surface runoff, or infiltration to groundwater.

The primary objective of the investigation of DDAA storage areas is to determine whether any "hot spots" of residual soil contamination are present at these locations. The specific data objectives for the investigation of DDAA storage areas are listed in Section 3.3.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4 below.

Since it is currently unknown whether any residual soil contamination remains at the DDAA sites, the investigation covered under this Work Plan will essentially be a screening investigation.

Two test pits will be excavated to bedrock at each former DDAA storage area site using a backhoe. Two or three samples from each test pit will be collected. The first sample, from a 0-3 inch depth, will be taken to provide surficial soil concentration information for evaluating the inhalation/ ingestion, dermal contact, and surface runoff pathways. The second (and third) samples will be collected from subsurface sample intervals determined by the geologist based on visual observation and HNU readings. These samples will be collected to provide subsurface soil contaminant concentrations to be used in estimating the amount of contaminant in the soil possibly available to groundwater. The subsurface samples will be biased to identify the maximum amount of contamination in the boring. If no unusual intervals are identified during the test-pit excavation, one of the subsurface samples will be collected from the soil lying directly above bedrock.

To aid in the determination of contaminant leachability from the soil, as well as to determine whether some of the soil could be considered "hazardous waste," one subsurface sample per area will be submitted for TCLP analyses. The TCLP procedure is going to be used for hazardous waste determinations under EPA's RCRA regulations in the near future.

300332

If significant contamination is found during the above program, the need for additional investigatory efforts will be assessed.

4.3.2.11 Drum Storage Areas

Historic aerial photographs from the site indicate that drums have been stored at several locations directly on top of soil (see Figure 3-2). There is concern that drum leakage, spillage, etc., may have created "hot spots" of residual soil contamination at these locations. Since it is presently unknown whether any residual soil contamination remains at the drum storage sites, the investigation covered under this Work Plan will essentially be a screening investigation. The specific data objectives for the drum storage areas investigation were listed in Section 3.3.

Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4 below.

Two soil borings will be advanced to bedrock at each former drum storage area site using a drill rig. Test borings were selected here, since some of the drum storage locations are now covered by pavement and the minimization of pavement disruption is desired (see Figure 3-2).

Two or three soil samples will be collected per boring location depending on the soil thickness. The first sample will be collected from a 0-3 inch depth, if no pavement is present. This sample will provide surficial soil concentration information for evaluating the inhalation/ingestion, dermal contact, and surface runoff pathways. If pavement is present, the first sample will be collected from the top layer of soils underlying the pavement and underlying sub-base. Sample results from this interval will be used to assess the possibility of groundwater degradation from this depth.

Subsurface soil samples will also be collected to provide subsurface soil contaminant concentrations to be used in estimating the amount of contaminant in the soil possibly available to groundwater. One or two subsurface soil samples will also be collected, depending on the depth to bedrock. A sample will be collected from each boring at the soil-bedrock interface. If bedrock is at a depth greater than 6 feet, a second subsurface sample will be collected from the interval below the depth that the surface sample was collected and above a depth of 6 feet. The sample interval will be specified by the geologist, based on visual observation and HNU readings. This last sample will be biased to identify the maximum amount of contamination in the interval. If no unusual soil layers are identified during drilling, the third sample will be collected from an interval selected by the geologist.

To aid in the determination of contaminant leachability from the soil, as well as to determine if some of the soil could be considered "hazardous waste," one subsurface sample per storage area will be submitted for TCLP analyses. The TCLP procedure will be used for hazardous waste determinations under EPA's RCRA regulations in the near future.

If significant contamination is found during the above program, the need for additional investigatory efforts will be assessed.

4.3.2.12 Onsite Soils Investigation

As described in Section 3.3.12, an onsite subsurface soils investigation is proposed. The objective of this investigation is to evaluate soil conditions in areas not adjacent to identified source areas. The investigation entails the drilling and sampling of 18 test borings, and the chemical analysis of selected soil samples from each borings (see Figure 3-2). Section 3.3.14 describes the scope of this investigation, while Section 4.3.2.1 details the test boring drilling and sampling techniques to be implemented. Soil samples will be analyzed for the parameters listed in Section 4.4.

4.3.2.13 Offsite Soils Investigation

The offsite soils investigation is designed to provide data regarding the extent of contamination in soils in the local area surrounding the site. The rationale behind the proposed investigation and the investigation scope is presented in Section 3.3.13. Drilling and sampling methodologies for the 22 borings (see Figure 3-4) and additional surface soil samples proposed for this study are presented in Section 4.3.2.1, as is the surface soil sample collection protocol. Analytical parameters for soil samples are listed in Section 4.4.

4.3.2.14 Surface Water and Sediment

Groundwater discharge and surface runoff are believed to be responsible for an increase in arsenic water and sediment concentrations in Tulpehocken Creek as it passes the site. Additionally, groundwater discharge has reportedly raised arsenic levels in the abandoned quarries near the site. Very few data regarding other contaminant concentrations in surface water and sediment were identified during the data review. To characterize the health and environmental risks presented by contaminant concentration increases in surface water and sediment, the following program has been developed.

The primary surface water and sediment investigation objectives are to determine the contaminant levels in surface water and sediment in Tulpehocken Creek as it enters and leaves the site vicinity; the extent of downstream contamination, if any; the contaminant levels in abandoned quarries near the site; and the effect of contaminants from the Whitmoyer site are having on aquatic biota.

The specific data objectives for the surface water and sediment investigation are listed in Section 3.3. Details on the sampling protocol described below are contained in the Whitmoyer FSAP. The analyses to be performed on the samples are discussed in Section 4.4.

The first item in the surface water program is to determine the effect(s) the Whitmoyer Laboratories Site is having on Tulpehocken Creek during differing baseflow conditions. To measure these effects, the surface water will be sampled twice (once in July and once in late summer or early fall). One of these sampling events will occur during summer baseflow, while the second event will occur during late summer or early fall, when low baseflow is expected to occur. Both filtered and unfiltered samples will be collected from 14 locations in Tulpehocken Creek. These locations are described in Table 3-8 and shown on Figures 3-5 and 3-6.

The surface-water samples will be collected by immersing the appropriate sample containers at the above locations in a zone at each location where the stream is well-mixed. Tulpehocken Creek will be sampled from downstream to upstream during the sampling events to avoid entraining sediments in the stream flow, which could possibly be sampled at downstream locations. Both field-filtered and unfiltered surface-water samples will be collected for comparison. The filtered samples will be collected using a 0.45 micron filter and a peristaltic pump, which does not contact the sample.

At 3 of the 14 sample locations, the upstream Prescott Drive Bridge, the immediately downstream Fairlane Avenue Bridge, and the further downstream College Street Bridge, unfiltered surface water samples will be collected for a full TAL-TCL (VOA and BNA) scan during the second sampling round. These samples will be used to assess the level of contaminants other than arsenic in the creek.

There is a concern that the acute freshwater quality criteria for arsenic will be exceeded during rain events, due to overland transport of both dissolved and sorbed arsenic. To address this concern, an overland transport model will be developed.

The approach to modeling the site for overland transport will be to collect pertinent modeling data before and during a rain event, followed by calibrating two or three simple models with the collected data. These models will then be used to predict the effects of different types of rain events (e.g., a 5-inch rain).

Necessary model input data includes surficial soil concentrations, baseflow groundwater contaminant discharge, stream flow and overland transport contaminant concentration during the rain event, duration and volume of rainfall, the arsenic sorption partition coefficient, and soil density, along with standard erosion parameters such as topography and type of ground cover. Surficial soil concentrations and densities will be measured during the surficial soil sampling program. Arsenic sorption partition coefficient will be derived during the subsurface soil sampling program. Standard erosion parameters will be derived by the topographic survey and visual observations at the site. Groundwater contaminant discharge will be estimated from the baseflow surface-water samples collected above.

To provide levels of arsenic contributions from stream flow and overland transport during a rain event, unfiltered surface water samples will be collected from the Ramona Road bridge and Fairlane Avenue bridge sample stations. The overland transport contribution will be measured by subtracting the expected groundwater transport loading from the total loading measured between the two sample locations.

Three samples will be collected from the Ramona Road (upstream) location. These samples will be collected at the start of the rainstorm, during the storm, and at the storm's conclusion.

Twenty-seven samples will be collected from the downstream location. These samples include one at the beginning of the rain, one during the rain, and one at the rain's conclusion, followed by one per hour during the next 24 hours. Additionally, stream flow will be measured at both sample points at the time of each sample's collection. Finally, the rainfall intensity will be measured by a continuous rainfall recorder.

Once the model input data is available, the models will be calibrated. The simple models to be used will include the Modified Universal Soil Loss Equation (MUSLE) and dissolved/sorbed contaminant release models present in the Superfund Exposure Assessment Manual (1987) and other yet-to-be-identified applicable models. Once these models have been calibrated, simulations will be performed to determine if Tulpehocken Creek will exceed the acute freshwater quality criteria during various rain events. These outputs will be incorporated into exposure and risk assessments for surface water at Whitmoyer.

Tulpehocken Creek sediment samples will be collected only during the second round of surface-water sampling at all 14 creek stations. These samples will be collected after the surface water sample is collected (to maximize sample representativeness) using a stainless-steel scoop. The top 1 foot of sediment will be sampled. At the sample locations the exact sampling spot will be selected at the location with the maximum amount of fines (small particles) present. Since these areas are expected to have the most contamination, this represents a worst-case, biased sampling strategy. Since the creek is relatively narrow near the site, the stream will not be transected, nor will sediment grab samples be composited for analysis.

The sediment samples from the same three sample locations where surface water samples were collected to be subjected to a full TCL-TAL scan and will also be analyzed for BNA, VOA, and inorganic analytes. This data will be evaluated to determine the presence of other contaminants in the creek sediment at the site.

Six surface-water and sediment samples will also be collected from lakes and quarries near the site. These bodies of water, which may be influenced by ground and surface-water contamination from the site, are Myerstown Pond, Lakeside Quarry, Charming Forge Lake, an abandoned quarry west of the site, and two abandoned quarries on the Wenger property northeast of the site. The uses of these water bodies were discussed in Section 2.0.

Prior to sampling these lakes, a dissolved oxygen and conductivity (DO) vertical profile in the lake will be generated using a DO-conductivity meter. If a lake is found to be well-mixed, a surface-water grab sample will be collected from anywhere in the lake-water column. If a lake is found to be stratified, a grab sample will be collected from the deepest (most anaerobic) zone. This zone is likely to have the highest arsenic concentrations in the lake. Water samples will be collected with a Kemmerer sampler or similar device.

Because of the difficulty in collecting sediment samples at significant water depths, these samples will be collected from shallow zones (or ledges) in the lakes. Samples will be collected from the area of the lake where surface water or groundwater most affected by the site would be entering the lake. This protocol will bias the sample to increase the probability of finding the highest sediment contaminant concentrations in the lake.

<u>Biological Assessment</u>

Aquatic biological surveys of areas impacted by the Whitmoyer Laboratories Site will include a benthic macroinvertebrate survey of Tulpehocken Creek and a fishery survey of area lakes as well as Tulpehocken Creek locations. Survey locations are listed in Table 3-8. A wetlands delineation study will also be conducted as a part of the assessment. The surveys will be completed in late summer or early fall. Should results of the surface water, sediment, or fish tissue chemical analysis show unusually high concentrations of arsenic, or other chemicals, the need for additional sampling will be assessed.

<u>Benthic Macroinvertebrates</u>

Macroinvertebrates are important intermediaries in the utilization and recycling of nutrients in the aquatic environment. They also serve as a major food source for fish and help determine the well-being of these populations. Additionally, they possess several characteristics that make them useful for detecting environmental stresses. First, most members possess limited mobility so that their status reflects conditions in the immediate vicinity of the collection. Secondly, they have life spans from several months to a few years. Thus, their community structure reflects conditions in the recent past, including intermittent fluctuations of water quality, which would be difficult to detect with periodic chemical sampling.

Macroinvertebrate sampling will consist of either quantitative or semi-quantitative collections. These types of collection determine the abundance of each taxa per unit area of habitat. In addition, such sampling provides measures of population densities and community diversity that may be used to detect variations over time and location. Community diversity reflects both the abundance and evenness of distribution of individuals in a collection. Lowered diversity values are often found immediately below a point source of pollution, because the communities are made up of many individuals from a pollution tolerant species.

Transects consisting of riffle-type habitat will be located within the study area. Table 3-8 lists proposed benthic macroinvertebrate sampling locations. Specific transect locations will be assigned prior to the invertebrate survey and will be photodocumented at the time of selection. An effort will be made to locate all transects near surface-water sampling points. Transects will be located to assure similar substrate and habitat type at all locations within each stream.

Macroinvertebrates will be sampled at two stations along each riffle transect. Each station will be located mid-way between each stream bank and mid-stream. Samples will be collected with a Surber bottom sampler (0.1 m^2 surface area), using equal time and effort at each station. However, should the stream depth exceed 1 foot at the majority of sampling locations, semi-quantitative collections will be made using a D-frame net (30 cm wide x 25 cm high) using equal time and effort at each station. The technique involves placing the net against the stream bottom and thoroughly disturbing the substrate directly upstream by kicking. Macroinvertebrates dislodged from the substrate are carried into the net by water current. A single sample is constituted by pooling two subsamples collected over a period of 1 minute each from the same area.

The use of kicknets as employed in this project is supported by scientific literature. According to Frost et al. (1971), kick net samples from similar habitats provide consistent information, and samples collected by different individuals showed little variation when habitats were similar. Frost, et al. (1971) noted that 87 percent of all benthic taxa were collected with two kicknet samples. Pollard and Kinney, in a EPA document (EPA, 1979), also compared the kicknet technique to other sampling methods. They found that the kicknet method collected more taxa and individuals per sample with equivalent or lower variability than the Surber sampler and the portable invertebrate box sampler. It should be pointed out that only one of the aforementioned samplers will be used at all locations in the study area, depending on field conditions.

Samples will be fixed in the field with 70 percent ethanol and returned to the laboratory, where the macroinvertebrates will be separated from the substrate, sorted, identified, and counted.

Samples will be analyzed individually for number of taxa and number of individuals per taxon. Community analyses on individual samples will include community diversity (Shannon-Weiner) index and percent composition by taxa.

Fish Sampling

Stream and lake fisheries will be sampled near the Whitmoyer Laboratories Site and analyzed for arsenic assimilation in fish organs and tissues. Collections will also be analyzed for species composition and relative abundance at each station. Table 3-8 lists fish sampling locations. All stations will be photo-documented when they are located.

Each stream station will be sampled using electrofishing equipment. Nets will be placed at the upper and lower limits of each station to block the movements of fish during shocking runs.

A standard length of stream (200 feet) will be sampled at each location. All individuals collected will be identified, weighed and measured (total length) in the field. Voucher specimens will be preserved in a 10 percent formalin solution and returned to the laboratory. Individuals selected for tissue analysis will be wrapped in aluminum foil, frozen using dry ice, and returned to the laboratory for processing. Stations located at standing bodies of water will be sampled using gill nets, minnow traps, and/or boat-mounted electrofishing equipment. Fish collections will be processed as described above for stream sampling. The total area sampled at each station will depend on the availability of fish and the total volume of sample required to perform the laboratory analysis.

Trout stocked by the Pennsylvania Fish Commission will be collected, if encountered. However, any trout collected may be recent introductions into the stream and will have limited exposure to chemicals leaching from the site. Therefore, resident benthic feeding fish and game fish populations will also be collected for laboratory analysis. Field biologists will select a minimum of five individuals from the most abundant species of benthic feeding and game fish collected for each composite tissue sample transferred to the laboratory for processing. However, more than five fish from a single species may be needed to attain the volume of sample required for chemical analysis. All individuals from each species selected will be wrapped in aluminum foil, labeled, chilled, and transported to the laboratory for processing.

Four composite fish samples will be collected for analysis from each station. Two composite whole-body samples (one composite of benthic feeders and one composite of game fish) will be collected to provide data on cumulative uptake of chemical in tissue and organs. Two composite fillet samples will also be collected to analyze the uptake of chemicals in edible portions of trout and resident game fish.

Each composite sample will be prepared using a minimum of five individual fish for the whole body analysis and ten fillets for the edible portion tissue analysis. Preparing the composite sample will involve homogenizing all tissue for each composite sample in a tissue blender (see Composite Procedures). Edible portions of fish will be removed using filleting knives on a work surface of aluminum foil. All filleting equipment, homogenizing equipment, and work surfaces will be decontaminated (see Decontamination Procedures) prior to and between each station and fish species processed. Homogenized samples will then be transferred to glass sample bottles, wrapped in aluminum foil, and frozen prior to shipment to the analytical laboratory for chemical analysis.

Field biologists will survey the Whitmoyer Laboratories Site adjacent to Union Canal and Tulpehocken Creek for the presence of wetland areas in late August. Survey methods used will be those outlined by the EPA's Wetland Identification and Delineation Manual (EPA, 1987c).

4.3.2.15 Offsite Hydrogeologic Investigation

The offsite hydrogeologic investigation proposed is designed to provide data with which to assess current groundwater quality conditions in the local area surrounding the site. A detailed presentation of the investigation is provided in Section 3.3.15, including a discussion of the rationale behind the various components of the investigation. This section describes or references the methodologies proposed to implement the planned investigation.

New monitoring wells proposed for the investigation (MW-201A through MW-208B) will be drilled and constructed as described in Section 4.3.2.1. The sampling of both these wells and the selected monitoring wells will be performed according to the methodology presented in Section 4.3.2.1 also. Sampling of residential wells will be performed by flushing water through the home's distribution system for 15-30 minutes, then withdrawing a sample from the system at the closest point possible to the well. If possible, the water sample will be obtained at a point prior to circulating through any filter or treatment system, which may be hooked up to the water distribution system.

4.3.2.16 Site Survey

An aerial photographic survey of the Whitmoyer Laboratories Site and immediate surrounding area, including onsite features (e.g., fences, gates, wells, buildings, and surface water) and topography (at 1-foot contour intervals), will be conducted once the Work Plan is approved. Once field work is complete, existing and newly installed monitoring wells will be surveyed for horizontal coordinates and elevation. Surface water (including staff gauges), and other outdoor sample locations will be surveyed for horizontal coordinates. Sample location maps will be prepared.

4.4 SAMPLE ANALYSIS AND VALIDATION

Section 4.3 of this Work Plan identified the various field investigations that will be used to characterize contamination at the Whitmoyer Laboratories Site, the purpose of each investigation, and the use of the data collected in the RI/FS. This section describes the number of samples, types of analyses, and the QA/QC requirements that are associated with the sampling activities. In addition to sampling QA/QC requirements (i.e., blanks, duplicates, etc.), data validation QC requirements are presented in this section. The proposed sampling program assumes that most analyses will be performed by Contract Laboratory Program (CLP) laboratories. REM III laboratories will be utilized for most of the wet chemistry analyses. Table 3-6 identifies the media, analytical method, number of samples (including QA/QC requirement), and level of analysis for each field investigation presented in Section 4.3. Table 4-1 summarizes the analytical program. Sampling procedures are outlined in the FSAP.

The analytical techniques proposed for a small percentage of the arsenic samples are not routine CLP methods and warrant discussion. As detailed in the preliminary risk assessment, arsenic is the primary contaminant of concern at the Whitmoyer Laboratory Site. A review of existing PRP records reveals <u>organic</u> as well as <u>inorganic</u> arsenic contamination is present. Many analytical references, including the WLI company files, indicate that a rigorous sample digestion is necessary to detect the true total arsenic content of samples containing organo-arsenical compounds. Sample digestion via a combination of strong acids and/or oxidants has been recommended (e.g., HNO_3, H_2SO_4, $K_2Cr_2O_7$, $K_2S_2O_8$). The current CLP sample digestion methods, which utilize nitric acid and hydrogen peroxide, should be sufficiently rigorous to yield total available or recoverable arsenic.

TABLE 4-1

SUMMARY OF LABORATORY ANALYSES
WHITMOYER LABORATORIES SITE

Unit	Media	VOA	BNAE	TAL	CN	Pest/ PCBs	TCLP (Metals)	As	Fe	Anl	Other
Vault	Waste	7	6(a)	6	4	4	4				2(b)
Vault perimeter soils	Soil	5	4(a)	4			2	8	8		
Vault tracer	Water										33(z)
Sludge from Consolidated Lagoon	Waste Sludge	12	10(a)	10	8	8	8	18	18	18	7(c)
Consolidated Lagoon Lysimeters	Water							14			8(f)
Consolidated Lagoon Perimeter Soils	Soils	6	5(a)	5			3	12	12		
Excavated Lagoon	Soil/Sludge	9	8(a)	8			6	24	24		
Process Buildings	Wipe Samples		180(a)					180			(d)
Process Buildings	Roof Drainage Water		5(a)					10			
Process Buildings	Soils	5	4(a)	4	4	4	2	8	8		6(e)
Wastes in Piping	Liquid Waste/Sludge			59							50(q)
Laboratory Wastes	Liquid Waste/Sludge			115			75				100(q) 100(aa)
Wastes in Tanks and Drums	Liquid Waste/Solids			36		36 (PCBs only)	20				120(q) 20(aa)
Waste Pit Soils/Sludge	Soil/Sludges	5	4(a)	4			2	10	10	10	
Soil Atten. Capacity	Liquid							46		46	48(h)
Soil Atten. Capacity	Soil							46	6	46	6(e) 48(h) 6(o) 6(p)

300342

TABLE 4-1
SUMMARY OF LABORATORY ANALYSES
WHITMOYER LABORATORIES SITE
PAGE TWO

Unit	Media	VOA	BNAE	TAL	CN	Pest/ PCBs	TCLP (Metals)	As	Fe	Anl	Other
Photographic Anomalies	Soil	14	11(a)	11			9	40		40	
Onsite Soils	Soil	13	11(a)	11			9	40	40		
Offsite Soils	Soils	15	13(a)	13			11	70	70		
1951 Pit Soils	Soil	5	4(a)	4			2	8	8	8	
DDAA Storage Areas	Soil	5	4(a)	4			2	10	10	10	
Drum Storage Areas	Soil	9	7(a)	7			5	22	22	22	
Surface Water	Water	7(i)	6(a)	6				73/ 34(j)	37/ 34(j)	37	36(k); 36(l); 36(t); 34(m); 34(n)
Sediments	Sediments	6	5(a)	5				19	19	13	20(c) 21(o) 20(p) 14(h)
Fish Tissue	Whole body Edible tissue							9 9			
Onsite Groundwater Round 1	Water	40	36(a)	36	7	7		36(x)			7(r) 32(s) 32(t) 32(m) 32(y)
Onsite Groundwater Round 2	Water	40	36(a)					35/ 34(j)			32(m) 32(y)

300343

TABLE 4-1
SUMMARY OF LABORATORY ANALYSES
WHITMOYER LABORATORIES SITE
PAGE THREE

Unit	Media	VOA	BNAE	TAL	CN	Pest/ PCBs	TCLP (Metals)	As	Fe	Anl	Other
Offsite Groundwater Round 1	Water	31	36(a)	36				40(x)			12(i) 32(s) 32(t) 32(m) 32(y)
Offsite Groundwater Round 2	Water	31	36(a)					36			12(i) 32(m) 32(y)
Lagoon Sludge or Sludge/Soil Mixtures											4(u)
Lagoon Cap											4(v)
Lagoon Liner											4(w)

Notes:

(1) - Includes QA/QC analyses.
(a) - Includes analysis for aniline.
(b) - Sludge density-Field analysis
(c) - pH/Eh
(d) - 11 asbestos samples; 12 aniline (air), and 4 methyl bromide (air) samples must be included.
(e) - Cation exchange capacity
(f) - pH
(g) - Ignitability(25), reactivity(25), corrosivity(25) testing
(h) - Tetrachloroethylene analysis
(i) - Utilize EPA Method 601/602
(j) - Unfiltered/filtered
(k) - Hardness
(l) - Suspended solids

TABLE 4-1
SUMMARY OF LABORATORY ANALYSES
WHITMOYER LABORATORIES SITE
PAGE FOUR

Notes (Continued):

(m) - pH, Eh, Specific conductance, T°, D.O.
(n) - Nitrate/nitrite
(o) - TOC (Total organic carbon)
(p) - Grain size
(q) - BTU content, ash content, reactivity, chloride content, ignitability, (lab)
(r) - As via SM303E prep 5.d.
(s) - Common anions
(t) - Alkalinity
(u) - 4 samples analyzed for unit weight, natural water content, one dimensional consolidation, unconfined compressive strength, specific gravity, grain size
(v) - 4 samples analyzed for unit weight, natural water content, grain size, specific gravity, triaxial permeability atterberg limits, density
(w) - 4 samples analyzed for unit weight, natural water content, grain size, specific gravity, triaxial permeability
(x) - Unfiltered analysis.
(y) - BOD_5, COD, and TOC
(z) - Lithium tracer
(aa)- GC/IR scan for primary organic constituents

In accordance with a teleconference among EPA Region III, EPA-CRL, and REM III personnel on March 18, 1988, the consensus opinion was that total recoverable arsenic data is suitable for risk assessment analysis. However, a more rigorous digestion may be needed to successfully yield a true total arsenic concentration, particularly in matrices where the arsenic is not already in solution (soils, wastes, sediments). A clear understanding of any significant difference between total arsenic and total recoverable arsenic may be critical to meeting the feasibility study objectives. The alternative analytical methods proposed for a small percentage of samples are recommended in light of the significant organic arsenic contamination noted at the Whitmoyer Site and will serve as a check on the normal CLP analytical methods.

The need for arsenic speciation studies has also been discussed by EPA Region III and REM III personnel in the RI/FS Scoping Meeting (February 17, 1988) and the Draft Work Plan Review Meeting (May 16, 1988). The consensus opinion was that while arsenic speciation tests may be required to set cleanup levels, speciation testing at this point is generally unwarranted. Arsenic speciation will only be important where media are marginally contaminated. When media are either grossly contaminated or clean, arsenic speciation will not affect the determination of whether to remediate or not. Therefore, since the degree of contamination at the site is presently unknown, only a small number of speciation tests will be included as part of this RI/FS scope of work. These tests will be conducted as part of treatability studies. If further speciation testing is desired once the RI data is received, a technical decision memorandum (TDM) requesting additional funding for this sampling will be prepared.

4.4.1 Onsite Monitoring Well Sample Analysis

A review of historical data indicates that the onsite groundwater is contaminated with arsenic and several volatile and BNA extractable organics.

Thirty-nine onsite groundwater wells will be sampled to determine the nature and extent of onsite groundwater contamination. Groundwater samples collected from each well will be analyzed for TCL volatiles and for TCL base neutral acid (BNA) extractable organics plus aniline. These samples will be analyzed for TAL inorganics using CLP protocols during the first round of samples, and for only arsenic and iron using CLP protocols during the second sampling round.

Groundwater collected from two wells located adjacent to the process buildings and two wells located adjacent to the vault and consolidated lagoons will be analyzed for total arsenic (Standard Methods for the Examination of Water and Wastewater-Method 303E.5.d), cyanide (CLP protocol), and pesticides/PCBs (CLP protocol).

300346

Water samples collected from each well will also be analyzed for several wet-chemistry parameters:

- Common anions: chloride, fluoride, nitrate, nitrite, orthophosphate, sulfates
- Total alkalinity

Specific conductance, temperature, dissolved oxygen, Eh, and pH field analyses will be conducted. These parameters serve to characterize chemical and hydrogeological characteristics of the groundwater and aquifer as well as providing information on the chemical state, toxicity, treatability, and/or fate and transport of contaminants. Duplicate water samples will be taken from selected wells and analyzed for appropriate parameters.

4.4.2 Offsite Wells

Twenty-two offsite wells and eight residential wells will be sampled to determine the extent of offsite groundwater contamination and to assess the public health risk posed by the contaminated groundwater. Groundwater samples from each well will be analyzed for TCL base neutral acid extractables plus aniline and for TAL metals using the CLP protocols. Volatile organics will be analyzed via EPA Method 601/602 for residential wells to obtain a detection level that would allow for a comparison with ARARs. Monitoring wells will be analyzed for volatile organics using Method 624. Water samples collected from each well will also be analyzed for common anions and total alkalinity using EPA analytical methods. Specific conductance, temperature, dissolved oxygen, Eh, and pH field analyses will be conducted on samples collected from all offsite wells. Duplicate samples will be collected from two offsite wells.

A second round of samples will be collected from all wells and analyzed for arsenic, TCL-volatiles, and TCL-BNA organics plus aniline.

4.4.3 Onsite and Offsite Surficial and Subsurface Soil Analysis

This section discusses the analyses conducted on the onsite/offsite surface/subsurface samples to determine the extent of onsite/offsite soil contamination.

4.4.3.1 Vault - Perimeter Soils

Soil samples collected at two or three depths from boreholes installed about the vault will be analyzed for total arsenic, iron, and aniline according to CLP protocols. One soil sample collected from every other borehole will be analyzed for TCL volatiles, TCLP metals, TAL metals, and TCL BNA organics. A duplicate soil sample may be collected and analyzed for TCL volatiles; TCL BNA organics plus aniline; and TAL metals, or arsenic and iron.

4.4.3.2 Consolidated Lagoons - Perimeter Soils

Borehole soil samples collected at two or three depths from five boreholes installed around the consolidated lagoons will be analyzed for arsenic and iron using CLP protocols. One sample from every other borehole will be analyzed for TCL-volatiles, TCL BNA organics plus aniline, and TAL inorganics. One duplicate sample may be collected and analyzed for BNA organics plus aniline; TCL volatiles; and TAL inorganics, or arsenic and iron.

4.4.3.3 Excavated Lagoons - Fill and Perimeter soils

Soil samples collected at two depths from seven test pits or soil borings within the excavated lagoon area and from three test pits located around the excavated lagoon area will be analyzed for arsenic and iron. One soil sample from every other sample point will be collected from just above the bedrock and analyzed for TCL volatiles, TCL BNA organics plus aniline, TAL metals, and TCLP metals.

4.4.3.4 Process Buildings - Soils

Soil samples collected at two depths from three soil borings drilled into the perimeter soils will be analyzed for arsenic and iron. Two additional soil samples will be analyzed for TAL metals, TCLP metals, TCL volatiles, and BNA organics plus aniline. CEC (cation exchange capacity) analysis will be conducted on samples collected from two of the boreholes. Two selected samples (excluding QC samples), will be analyzed for cyanide and pesticides/PCBs.

4.4.3.5 Non-Source Related - Onsite Surface/Subsurface Soils

Eighteen non-source-related, onsite, surface soil samples and 18 subsurface soil samples will be analyzed for arsenic and iron. Nine additional subsurface samples, excluding QC samples, will be analyzed for TCL volatiles, TCL BNA organics, TCLP metals, and TAL inorganics.

4.4.3.5 Offsite Surface/Subsurface Soils

Twenty-eight (28) offsite surface soil samples and 22 subsurface soil samples will be analyzed for arsenic and iron. Additionally, 11 subsurface samples (1 per every other boring) will be analyzed for TCL volatiles, TCLP metals, BNA organics plus aniline, and TAL metals. One duplicate site/background soil sample will be collected for every 20 samples collected.

4.4.4 Process Building and Equipment Wipe Sample Analysis

Surficial contamination of floors, walls, ceilings, and equipment, resulting from the deposition of volatile, semivolatile, and particulate contaminants during the manufacturing process, is a concern. Wipe samples collected from the floors, walls, ceilings, and equipment will be analyzed for total arsenic and the base neutral acid extractable organics plus aniline. CLP protocol methods (for waste samples) will be utilized for the BNA organic and arsenic analyses.

The BNA (plus aniline) samples will be collected using the wipe sampling protocol presented in the EBASCO REM III Field Technical guidelines (No. FT-7.12, 02-28-86). Glass fiber filters wetted with a 1:4 acetone hexane solvent mixture will be used to collect the samples.

Particulate arsenic wipe samples will be collected with Whatman 541 filter paper. The sample will be digested according to a method described in the American Industrial Hygiene Journal (1984).

The actual number of wipe sample locations will be determined in the field after a survey of the rooms and equipment within each of the buildings. A budget of 156 samples (excluding QC samples) has been estimated. Duplicate wipe samples, collected on the surface area directly adjoining the original sample location, will be taken for every twenty samples collected.

4.4.5 Waste Pits (Building 6, 9, and 11), 1951 Pit, Photographic Anomalies, DDAA Storage Areas, and Drum Storage Areas

All soil/waste samples collected during the investigation of the 1951 waste pit, the waste pits associated with Buildings 6, 9, and 11 photographic anomalies, DDAA storage areas and drum storage areas will be analyzed for arsenic, iron, and aniline. One soil/waste samples from every other test pit will also be analyzed for TCL volatiles, TCL-BNA plus aniline, TAL metals, and TCLP (metals only).

4.4.6 Piping, Drum, Laboratory Waste and Tank Sample Analysis

Liquid, sludge, or solid waste samples (high-hazard) collected from plant piping, wastewater tanks, laboratory wastes, and drums (estimated 190, excluding QC samples), will be analyzed for TAL metals using CLP protocols. All samples will also be analyzed for ignitability (SW846-1010), reactivity (SW846), BTU content, ash content, and chlorine content. For those drums whose organic contents are unknown (estimated at 20) and laboratory waste drums (estimated at 100), a sample will be analyzed using a GC/IR scan to identify the primary constituent(s). All solid samples (estimated at 95) will be subjected to the TCLP for metals. All samples will also be analyzed for compatibility and disposal parameters, e.g., halogen presence, in the field.

4.4.7 Surface Water Sample Analysis

Two rounds of unfiltered and filtered surface water samples collected from 14 creek locations and 6 unfiltered samples from pond/quarry locations will be analyzed for arsenic and iron (CLP protocol). Water samples from each location will also be analyzed for nitrate/nitrite, total suspended solids, hardness and total alkalinity (EPA protocols-REM III Laboratory).

Specific conductance, dissolved oxygen, Eh, pH, and temperature field measurements will also be made at each location. Samples collected from one location upstream of the Whitmoyer Laboratories Site (Prescott Drive Bridge) and from two downstream locations (Fairlane Avenue Bridge and College Street Bridge) during the second round of sampling will also be analyzed for TCL volatiles, BNA organics plus aniline, and the TAL metals, using CLP protocol methods.

Thirty (30) rain event (run-off) samples will be collected from Tulpehocken Creek. All of these samples will be unfiltered and analyzed for arsenic.

4.4.8 Sediment Sample Analysis

Sediment samples collected from the creek and pond/quarry locations will be analyzed for the following parameters:

- Arsenic, iron - CLP protocols
- Total organic carbon - EPA protocol
- Grain size distribution - ASTM protocol
- Cation exchange capacity - SW9081 protocol
- Eh, pH - SW846 protocols
- Aniline, PCE-CLP protocols (creek only)

Sediments samples collected from the three creek sample locations specified in Section 4.4.7 will also be analyzed for TAL metals, TCL volatiles, and TCL-BNAE organics plus aniline.

4.4.9 Vault Contents Sample Analysis

Vault waste samples will be collected at two depths from two boreholes excavated into the waste sludge. The samples collected will be analyzed for TCL volatiles, base neutral acid extractables plus aniline, TAL metals, and TCLP metals using CLP protocols. Samples collected from one of the boreholes will also be analyzed for TCL pesticides/PCBs and cyanide (CLP protocol).

4.4.10 Lagoon Contents Sample Analysis

Both surface soil and subsurface waste sludge samples will be collected during the investigation of the consolidated lagoons. Three samples will be collected from each of 8 borings.

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All samples will be analyzed for arsenic, iron, and aniline using CLP protocols. Eh, pH, TCL pesticides/PCBs and cyanide will be measured on all samples collected from two boreholes. One sample from each borehole will be analyzed for TCL volatiles, TCL BNAE organics plus aniline, TAL metals, and TCLP metals. Additionally samples from the lagoon liner, cap and sludge material will be submitted for laboratory permeability testing. Lagoon sludge material will also be submitted for consolidation and strength characteristics testing.

Water samples collected from the lysimeters installed into the consolidated lagoons will be analyzed for arsenic (CLP methods), and pH in the field.

4.4.11 Air-Monitoring Sampling Analysis

Air monitoring samples collected in accordance with the recommendations of the Whitmoyer Site Health and Safety Officer will be analyzed for aniline and methyl bromide. The aniline samples (Buildings 1, 2, 3, 6, and 7) will be collected and analyzed according to NIOSH Method 5310 (silica gel collection media; GCFID-analysis). The methyl bromide samples (Building 5) will be collected and analyzed according to NIOSH Method 5372 (petroleum-based charcoal collection media; GCFID analysis). Prior to the sample collection, Draeger tubes will be used to determine gross contaminant levels within the buildings and to estimate the air volumes necessary to adequately sample for aniline and methyl bromide without exhausting the sampling media capacity.

4.4.12 Data Validation

Validation is a systematic process of reviewing a body of data to provide assurance that the data are adequate for their intended use. The process includes the following activities:

- Auditing measurement system calibration and calibration verification.
- Auditing quality control activities.
- Screening data sets.
- Reviewing data for technical credibility versus the sample site setting.
- Auditing field sample data records and chain-of-custody.
- Checking intermediate calculations.
- Certifying the previous process.

The review and validation of CLP and REM III laboratory data will be conducted by REM III Team chemists in accordance with EPA Central Regional Laboratory validation requirements.

4.5 DATA EVALUATION

The purpose of this task is to organize validated data and other information collected during the field investigations into a working format for analysis, and then perform the necessary evaluations to meet the project objectives. This task, therefore, has two distinct components: (1) data reduction and tabulation and (2) data evaluation and analysis. The following paragraphs briefly describe these components.

4.5.1 Data Reduction and Tabulation

Data obtained from the various field investigations will be condensed and organized to facilitate evaluation and presentation in this subtask. Reduction of hydrogeologic data will result in the production of various tables, figures, and drawings describing and summarizing the pertinent site features. These might include

- Figures displaying boring and monitoring well locations and elevations.
- Various hydrogeologic cross-sections.
- Flow nets and groundwater contour maps.
- Descriptive logs of test pits, soil borings, and monitoring wells.
- Aquifer test data.

Reduction of analytical (chemical) data will also result in tables, figures, and/or drawings depicting the extent of onsite/offsite contamination in the various media at the Whitmoyer Laboratory Site. Data reduction will be facilitated by computerized sorting and manipulation of the validated analytical results.

4.5.2 Data Evaluation and Analysis

This section briefly summarizes the methodologies that will be used to evaluate validated analytical data collected as a result of site field investigations.

Data collected from all media sampled (waste, soil, water, sediment, wipe samples) will be compared to background chemical contaminant concentrations. Whenever possible, statistical evaluations will be conducted to detect significant differences between onsite/offsite contaminant levels and background levels and to identify trends in the data. The principal contaminant migration pathways will also be identified through a review of this data.

Data collected as a result of sampling of onsite drums, tanks, and laboratory wastes will be evaluated using the EPA RCRA regulations to determine the waste status for disposal purposes. Additionally, the drum, tank, and laboratory waste data will be evaluated to determine if some of the containerized waste is amenable to incineration.

The contaminant loading of each waste source (e.g., consolidated, lagoons, vaults) will be evaluated using data (e.g., TCLP data) collected from the waste source and the surroundings soils, groundwater, and surface water. A wide range of indicator parameters, e.g., iron, TOC, and CEC, will be collected to assist in the evaluation of fate and transport of the contaminants. When applicable, simplistic groundwater and surface-water transport models will be used to describe offsite contaminant migration.

All data collected will be reviewed and evaluated to determine whether any "data gaps" exist. If necessary, recommendations for additional sampling and/or analysis will be made.

4.6 TASK 6 - RISK ASSESSMENT

The public health/environmental assessment will address the potential human health and environmental effects associated with the Whitmoyer Laboratory Site by the no-action alternative. The no-action alternative assumes that no remedial (corrective) actions will take place at the site other than those actions already taken. Evaluation of the no-action alternative is required under Section 300.68(f)(v) of the National Contingency Plan (NCP). By conducting such an assessment, the EPA will be able to determine if remedial actions are indicated for any area of the site.

The first step in the public health/environmental assessment is the review of the results of the environmental sampling and other information developed during the RI to identify chemicals of potential concern for detailed study during the risk assessment. A key element in this screening process is a comparison of site concentrations of contaminants to background levels of these chemicals in appropriate media; naturally occurring chemicals present at background concentrations may not be considered to be site-related and will not be evaluated in the assessment. In addition, chemicals present in blanks at similar concentrations (i.e., laboratory and field contaminants) will not be selected for the detailed analysis. Depending on the number of chemicals detected at the site, selection of a subset of chemicals referred to as the chemicals of concern or indicator chemicals may not be necessary. If the selection is needed, relative concentration, mobility, persistence, and toxicity of the contaminants in the environmental samples taken at the site will be considered.

Previous sampling of wastes and environmental media conducted by the EPA, PADER, and PRPs indicates that arsenic is the predominant contaminant of concern at the Whitmoyer Laboratories Site. Onsite and offsite contamination of groundwater, surface water, soil, and sediments by arsenic, volatile organic compounds (e.g., PCE), and BNA organics (principally aniline) has been documented.

300353

The chemicals noted above will be included as chemicals of concern for the site along with any other chemicals associated with adverse public health or environmental impact.

The second step in the public health/environmental assessment is the identification of actual or potential routes of exposure and the characterization of the probable magnitude of exposure to human or environmental receptors. The wetland delineation and biota assessment studies to be conducted along the Tulpehocken Creek will be critical to the environmental assessment.

The following potential exposure pathways may be important under current or future land use at the Whitmoyer Laboratories Site:

- Groundwater
  - Ingestion of contaminated groundwater.
  - Inhalation of volatiles released from the groundwater.
  - Skin absorption of groundwater contaminants.
- Surface water
  - Ingestion of contaminated surface water.
  - Skin absorption of surface water contaminants.
  - Consumption of contaminated fish.
- Soils/Sediments
  - Direct contact.
  - Accidental ingestion.
- Air
  - Inhalation of airborne contaminants migrating off site.
  - Inhalation of contaminant-laden dusts within buildings.

For each exposure scenario, concentrations in relevant environmental media (air, surface water, groundwater, and soil) at the potential receptor locations will be identified. Where concentrations have not been measured at the exposure point, estimates of current concentrations may, in certain instances, be made using models. The choice of models will be based on the sampling results. They may be simple partitioning models to determine release from soil or water to another medium (e.g., air) or more complex transport models. It is not possible to identify the specific models that may be selected here, since it is not known what the data will reveal about the distribution of chemicals from the site. Should the modeling become necessary, the appropriate models will be selected from the available literature (i.e., EPA publications and reviewed journals). All models and assumptions will be documented in the report and supplemented with appendices.

Chemical intakes for each human exposure scenario will be estimated based on frequency and duration of exposure and rate of media intake (e.g., amount of water ingested per day). Human exposure is expressed in terms of intake, which is the amount of a substance taken into the body per unit body weight per unit time. A chronic daily intake (CDI) is averaged over a lifetime for carcinogens (EPA, 1987b) and over the exposure period for noncarcinogens (EPA, 1987b). The CDI is calculated separately for each exposure pathway, since different populations-at-risk may be affected by the individual pathways. The assumptions used in these estimates will be stated clearly and thoroughly documented. The assumptions will be selected to represent "plausible" and "worst case" exposure scenarios. The exposure of nonhuman receptors will be estimated based on the sampling results or, if necessary, on the use of appropriate models that have appeared in the literature.

The third step in the public health/environmental assessment is the toxicity assessment, which identifies the critical toxicity values for each chemical of potential concern.

For humans, toxicity data will be presented in the following forms:

- For carcinogens, the carcinogenic potency factor, in the units mg/kg/day.

- For noncarcinogens, the estimated risk reference dose (Rfd) (formerly called acceptable daily intake [ADI]) in the units mg/kg/day.

- For chemicals for which no critical toxicity values are available, a semi-quantitative characterization based on any pertinent information that is available (e.g., subchronic toxicity studies or structural analogies). The basis for any toxicity values developed by the REM III team for this assessment will be included as an appendix.

For environmental receptors, environmental contaminant concentrations that have been associated with adverse effects in field or laboratory studies will be identified and compared to the fish analysis and to the aqueous and sediment receptor analysis. In addition, the fishery assessment and benthic invertebrate survey will assess for abnormalities, sensitive species, diversity, etc. If limited data is available on the environmental effects of some of the Whitmoyer Laboratories Chemicals of concern, the toxic potential will be evaluated in a semi-quantitative manner.

In addition to critical toxicity values, any Applicable or Relevant and Appropriate Requirements (ARARs) that have been established for the potential chemicals of concern will be identified. Currently, EPA considers MCLs and MCLGs developed under the Safe Drinking Water Act, Federal Ambient Water Quality Criteria (AWQC), National Ambient Air Quality Standards (NAAQS), and State environmental standards to be potential ARARs for use in risk assessment at Superfund sites.

Finally, the potential adverse effects on human health is assessed, where possible, by comparing contaminant concentrations found at or near the site with the applicable or relevant and appropriate requirements (ARARs) previously identified. However, if suitable ARAR is not available for a chemicals of concern or for the exposure scenarios considered, a quantitative risk assessment must also be performed. It is anticipated that ARARs will not be available for all chemicals of concern or for all environmental media (e.g., dust within buildings, soil, sediment) that will be considered in this assessment.

The evaluation of noncarcinogenic health risks associated with contaminants of concern considered in this report is based primarily on a comparison of the estimated daily intake of the indicator chemicals with appropriate critical toxicity values for the protection of human health described above. For potential carcinogens, the estimated cancer risks associated with exposure are calculated using EPA-derived cancer potency factors. Specifically, excess lifetime cancer risks are obtained by multiplying the cancer potency factor by the average daily intake of the contaminant under consideration. This procedure is considered to be appropriate for low doses, such as would potentially result from this site. In this assessment, the effects of exposure to each of the contaminants under the scenarios evaluated will initially be considered separately.

However, contaminants occur together, and individuals may be exposed to a mixture of the contaminants. Consequently, it is important to recognize the potential adverse effects (i.e., synergistic effects) that these mixtures can have in humans. Suitable data are not available to characterize the effects of chemical mixtures potentially present at or near Whitmoyer Laboratories Site. As suggested in EPA guidance (EPA, 1987b) for evaluating mixtures, however, the excess cancer risks or to calculate hazard indices can be added.

Risk assessments will be conducted separately for each exposure pathway and for each source, when appropriate. Results will be presented separately for the "average exposure case" and the "plausible maximum case" exposure assumptions. The risk assessment for each exposure pathway will include a discussion of the uncertainties in the estimates.

Ecological risk assessment is a process for assessing the probability or likelihood of adverse effects on the environmental or on some specific component or population. In general, this assessment process combines the same types of information on receptor characteristics, toxicological hazard, and exposure with a model or method to generate an estimate of risk. Risk models may be qualitative or quantitative in approach, and may vary in the extent to which they consider and integrate information on contaminant properties, exposure levels, and other environmental stresses. Information on environmental toxicity properties of contaminants, or standards such as the Ambient Water Quality Criteria, will be combined as available with estimates of environmental exposure levels to derive estimates of risk to environmental populations. The environmental risk assessment also will use results of biota sampling, in-situ bioassays, or specific laboratory toxicity test, if any, conducted during the RI.

For environmental receptors, environmental concentrations that have been associated with adverse effects in field or laboratory studies may be identified when available.

Risk assessments will be conducted separately for each exposure pathway and for each source, when appropriate. Results will be presented for the "plausible" and "worst case" exposure assumptions. The risk assessment for each exposure pathway will include a discussion of the uncertainties in the estimates.

4.7 TASK 7 - TREATABILITY STUDY/PILOT TESTING

A broad list of potential remedial technologies is presented in Table 3-3. As part of this project, criteria will be developed to screen the technologies. This will result in a short list of potential technologies for which treatability study/pilot testing will be considered, based on their applicability to conditions peculiar to the Whitmoyer Laboratories Site.

Based on initial review of available data, it appears that treatment of the calcium arsenate sludge in the vault, the lagoon sludge material, and groundwater may be a desirable component of proposed remedial alternative(s). A preliminary review of available technical literature pertaining to traditional and innovative treatment technologies for the lagoon and vault arsenate sludge has been initiated concurrent with development of this Work Plan. The review will provide data to evaluate the level of current development of various technologies and the potential applicability of each to the arsenate sludge Whitmoyer Laboratories Site.

Each technology will be evaluated for its degree of environmental and public health protection, based on the established remedial objectives. The public health evaluation focuses on the effects of each technology in eliminating the unacceptable health risks associated with the identified pathways. The effects of construction-related activities on the public are also considered. The environmental evaluation addresses the effects of each technology in eliminating risks to the environment from the contamination exposure pathways. If applicable, the evaluation will also consider the regulatory cleanup requirements.

The technologies identified will be further evaluated using the following criteria:

- Implementability - Constructability and length of time to achieve cleanup will be evaluated.
- Technical Development Status - Technologies will be assessed based on the level of field application (i.e., technologies might be classified as innovative, emerging, demonstrated, or commercially available). Effectiveness of the technologies will be based on the degree of field demonstration.
- Reliability - Operation and maintenance requirements will be assessed, and the useful life of the technology will be evaluated.

As a result of this evaluation of technologies, development of a Treatability Study Work Plan for the arsenate sludge may be warranted.

Similarly, as the RI/FS progresses, technologies potentially applicable at some of the other source areas (e.g., process buildings) or for some of the site media, e.g., soil or groundwater, will be evaluated. Development of a Treatability Study Work Plan may also be warranted for these areas.

At present, it is impossible to predict the scope of any Treatability Stud(y)ies for this RI/FS. However, since it appears likely that one or more Treatability Studies will be required to conclude this RI/FS, a Treatability Study budget has been created to facilitate these studies. This budget contains sufficient funds for the evaluation of technologies for two source types or media (including the arsenate sludge waste), and for the conduct of three bench-scale studies on these materials.

4.8 TASK 8 - REMEDIAL INVESTIGATION REPORT

This task of the Whitmoyer Laboratories Site RI/FS consists of the preparation of the draft and final versions of the RI report, as well as technical memoranda issued during the RI to inform EPA of progress and results. Technical memoranda will be issued at the following milestones during the RI:

- Completion of sampling of existing residential and commercial producing wells and site monitoring wells.
- Completion of the hydrogeologic, soils, and surface water/sediment investigation, including all sampling activities.
- Completion of all sample analyses.

These technical memoranda will present field data and preliminary indications of how each element relates to site conditions. Detailed evaluations of overall site conditions will not be presented in these memoranda. Changes in subsequent field activities, made on the basis of data from an earlier activity, will be discussed in the appropriate technical memorandum.

The RI report will summarize the data collected and the conclusions drawn from the investigative areas, and will include the following information:

- Stratigraphic cross-sections.
- Groundwater contour maps.
- Laboratory analyses (chemical and physical) results.
- Risk assessment results, including no-action baseline.
- Results of evaluation of potential treatability study/ pilot testing.

A meeting will be held at EPA Region III following the development of the Draft RI Report. This meeting will summarize the findings of the RI.

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5.0 TASK PLAN FOR FEASIBILITY STUDY

Based on the results of the RI, a Feasibility Study (FS) will be conducted for the Whitmoyer Laboratories Site. The FS will consist of 4 tasks as follows:

- Task 9 - Remedial Alternatives Screening
- Task 10 - Remedial Alternatives Evaluation
- Task 11 - Feasibility Study Report
- Task 12 - Post RI/FS Support

The overall objective of the Whitmoyer Laboratories Site FS is to screen and evaluate remedial alternatives based on the results of the RI and, in particular, the risk assessment. This information will be sufficient to allow EPA to select a remedial action that is

- Protective of human health and the environment.
- Cost-effective.
- In accordance with CERCLA as amended by SARA.
- In accordance with the NCP (Section 300.68).
- In compliance with ARARs.
- Effective over both the short and long term.
- Implementable.
- Acceptable to state authorities and the local community.

5.1 TASK 9 - REMEDIAL ALTERNATIVES SCREENING

Remedial alternatives will be screened as the first step in the FS process. The objective of this task is to refine the range of response actions developed during the scoping process (Task 1) which are presented in Table 3-3. This task will employ data collected in the Field Investigation (Task 3), and Risk Assessment (Task 6). The subtasks comprising Task 9 will accomplish the following objectives:

- Development of remedial response objectives and General Response Actions.

- Identification of applicable technologies and assembly of alternatives.

- Screening of remedial technologies/alternatives.

5.1.1 <u>Development of Remedial Response Objectives and Response Actions</u>

Based on the data collected in the RI, the remedial response objectives will be developed more fully. Specific response objectives will be developed using a risk-based methodology to define cleanup levels that would mitigate risks to public health and the environment to acceptable levels. Potential contaminant migration pathways and exposure pathways, identified in the Risk Assessment, will be examined further as a basis for estimating acceptable onsite residual contamination levels. Acceptable exposure levels for potential receptors will be identified and onsite cleanup levels will then be estimated by extrapolating from receptor points back to source areas (if defined) along critical migration pathways. Development of response objectives will also include refinement of ARARs specific to the Whitmoyer Laboratories Site.

5.1.2 Identification of Applicable Technologies and Assembly of Alternatives

Based on the remedial response objectives, a list of applicable technologies will be identified. This list will contain technologies previously identified in Section 3.4. After potential remedial technologies have been chosen, operable units may be defined for each site condition requiring remediation. Each operable unit should meet at least one response objective.

After operable units have been defined, remedial alternatives will be identified. Each remedial alternative will be an overall site remedy incorporating more than one operable unit. The no-action alternative will be considered as a base-line against which the other alternatives can be evaluated.

CERCLA, as amended by SARA, states that, to the maximum extent practicable, remedial actions that utilize permanent solutions and alternative treatment technologies or resource recovery technologies must be selected. Therefore, remedial actions that use these technologies will specifically be considered. To the extent possible, treatment options will emphasize alternatives that eliminate the need for long-term management at the site and alternatives involving treatment that would reduce toxicity, mobility, and volume as a principal goal.

5.1.3 Screening of Remedial Technologies and Alternatives

The lists of technologies and alternatives discussed previously will be screened. The objective of this effort is to eliminate from further consideration any technologies and alternatives that have undesirable results regarding implementability, effectiveness, and cost. The list of alternatives being considered will be narrowed by eliminating

- Technologies/alternatives which are not implementable or technically applicable.

- Technologies/alternatives which are not effective because they have adverse environmental impacts, do not provide adequate protection of public health, or do not attain ARARs; and

- Technologies/alternatives that are more costly than other alternatives/technologies but do not provide greater environmental or public health benefits, reliability, or a more permanent solution. Costs will not be used to discriminate between treatment technologies and nontreatment technologies.

- Technologies/alternatives which are unacceptable or are unlikely to be supported by state authorities and the local community based on available knowledge.

Reasons for elimination of any alternative at this stage will be documented in the FS report.

5.2 TASK 10 - REMEDIAL ALTERNATIVES EVALUATION

Remedial alternatives which pass the initial screening process (Task 9) will be further evaluated and compared as required in the NCP and in CERCLA as amended by SARA. Effectiveness, implementability, and cost will be considered. The effectiveness evaluation will include consideration of public health risks, environmental impacts, and attainment of ARARs. As part of this evaluation process, SARA Subsection 121(b)(1) requires that waste, site, and inherent limitations, as well as the ability of each alternative to meet ARARs, be taken into account. Factors that should receive special consideration include

- The long-term uncertainties of land disposal.
- The goals and requirements of the Solid Waste Disposal Act.
- The persistence, toxicity, mobility, and bioaccumulation of contaminants at the site.
- The short- and long-term potential for adverse human health effects.
- The long-term operation and maintenance costs.
- The potential for future remedial action costs if the remedy fails.
- The potential threat to human health and the environment from the excavation, transportation, and redisposal or containment of hazardous substances, pollutants, or contaminants.

Both short- and long-term effects for each of these factors will be assessed. To the extent possible, remedial alternatives that use permanent solutions and alternative treatment technologies will be considered.

5.3 TASK 11 - FEASIBILITY STUDY REPORT

Task 11 will consist of the following subtasks:

- Summarize each alternative in terms of effectiveness, implementability, and cost.
- Compare the remedial alternatives.
- Prepare the draft and final FS report.

The FS report will include an executive summary, an introduction, a description of the screening and evaluation process, a summary of the detailed technical and cost evaluations, and a comparative evaluation of the remedial alternatives. This summary will be presented as table matrices. Back-up information and calculations will be included as appendices.

Following the development of the Draft FS, a meeting will be conducted at the EPA Region III offices to discuss the alternatives considered for the RI/FS.

5.4 TASK 12 - POST-RI/FS SUPPORT

The REM III team will provide technical support to EPA following the completion of the Whitmoyer Laboratories Site RI/FS. This support will include preparation of the Record of Decision (by EPA) and assistance to the U.S. Army Corps of Engineers or other parties involved in the remedial design/remedial action.

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6

6.0 PROJECT MANAGEMENT APPROACH

6.1 ORGANIZATION AND APPROACH

The proposed project organization for the Whitmoyer Laboratories Site RI/FS is shown in Figure 6-1. The Regional Manager (RM), Mr. Richard C Evans, is responsible for the quality of all REM III work performed in Region III. Mr. George Latulippe will serve as the project Site Manager (SM). The SM has primary responsibility for implementing and executing the RI/FS. Supporting the SM are the Field Operations Leader (FOL), FS Leader, the RI Leader, and other technical support staff. The FOL is responsible for the onsite management of activities for the duration of the site investigation. The RI leader is responsible for the implementation of the RI and preparation of the RI report. The FS Leader is responsible for the implementation and preparation of the FS report.

The RI/FS tasks included in this Work Plan, in addition to the schedule and budget, comprise the baseline plans which form an integrated management information system against which work assignment progress can be measured. The baseline plans are a precise description of how the work assignment will be executed in terms of scope, schedule, and budget. The project schedule and detailed cost estimate are presented in Sections 6.3 and 6.4, respectively.

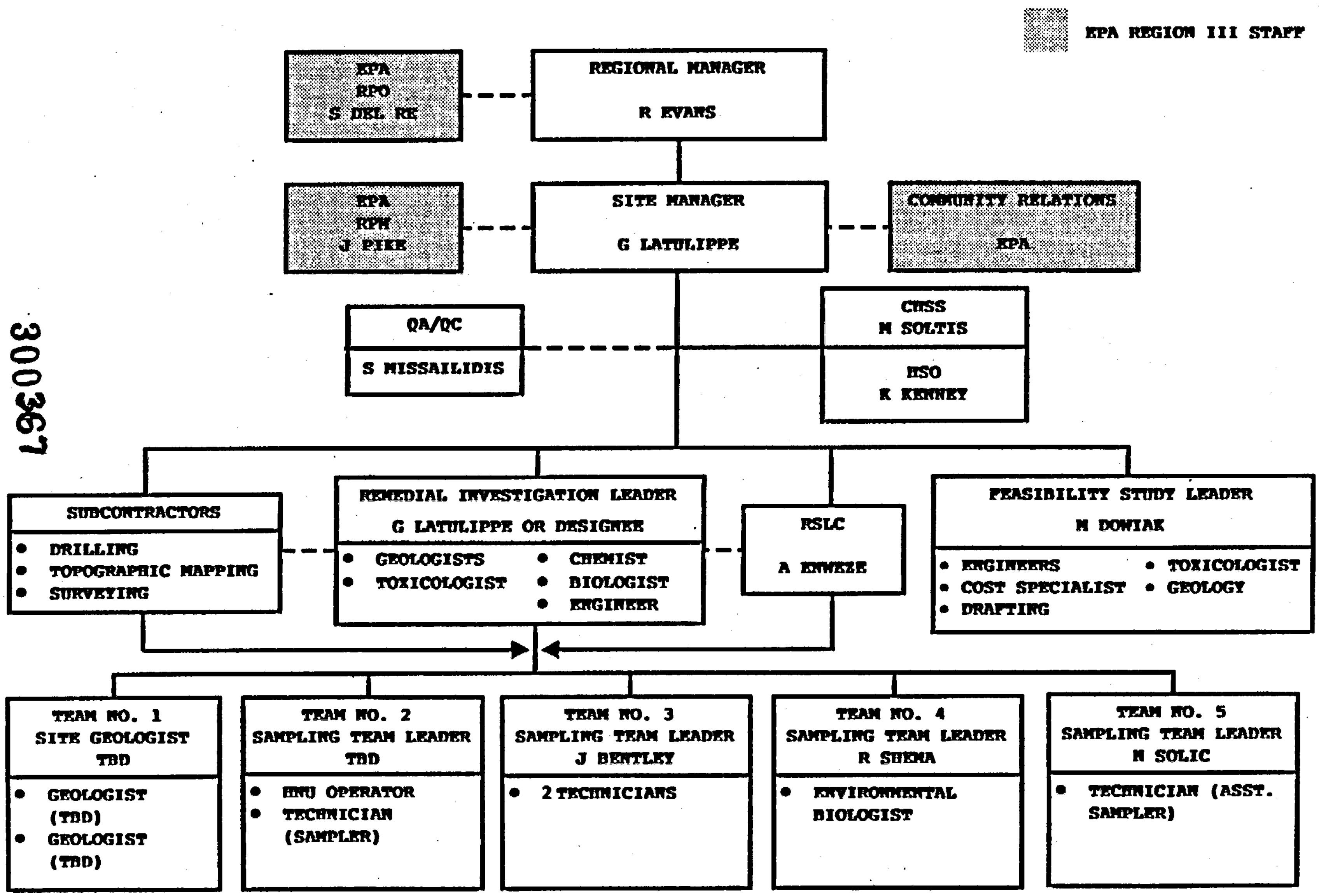
6.2 QUALITY ASSURANCE AND DATA MANAGEMENT

The site-specific quality assurance requirements will be in accordance with the Quality Assurance Program Plan (QAPP) for the REM III program, as approved by EPA. The REM III QAPP provides general guidance on the following subjects:

- Project organization and responsibility; and
- QA objectives for measurement of data in terms of precision, accuracy, representativeness, completeness, and comparability.

Data management aspects of the program pertain to controlling and filing documents. REM III has developed a program filing system (Administrative Guideline Number PA-5) that conforms to the requirements of EPA and the REM III Program to ensure that the integrity of the documents is safeguarded. This guideline will be implemented to control and file all documents associated with the Whitmoyer Laboratories Site RI/FS. The system includes document receipt control procedures, a file review and inspection system, and security measures to be followed.

FIGURE 6-1
PROJECT ORGANIZATION
WHITMOYER LABORATORIES SITE



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6.3 PROJECT SCHEDULE

Figure 6-2 (located in the attached pouch) depicts the schedule of tasks and activities for the Whitmoyer Laboratories Site RI/FS. The schedule for the field investigation assumes that no site restrictions will be encountered and is dependent upon EPA approval of this Work Plan and the FOP by June 20, 1988.

6.4 COST ESTIMATES

The detailed cost estimate for the Whitmoyer Laboratories Site RI/FS is presented under separate cover in the Optional Form 60 (OF-60). Costs for CLP analysis are not included in the REM III Team total cost. Costs for potential additional investigations are not included in the estimates for this Work Plan.

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300369

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300373

APPENDIX A

FEDERAL AND COMMONWEALTH OF PENNSYLVANIA ARARs
POTENTIALLY APPLICABLE TO THE
WHITMOYER LABORATORIES SITE

APPENDIX A

FEDERAL AND COMMONWEALTH OF PENNSYLVANIA ARARs POTENTIALLY APPLICABLE TO THE WHITMOYER LABORATORIES SITE

Tables A-1 and A-2 summarize, respectively, preliminary lists of Federal and Commonwealth of Pennsylvania ARARs identified for the Whitmoyer Laboratories Site. A description of these requirements follows. The ARARs identified in Tables A-1 and A-2 will be refined and revised at a later date to consider site conditions and potential remedial actions as the RI/FS process develops.

Federal ARARs include the following:

- National Contingency Plan (NCP) (40 CFR Part 300) - Originally developed under the Clean Water Act, the NCP provides the framework for cleanup and remedial action of Environmental releases of pollutants.

- Superfund Amendments and Reauthorization Act of 1986 - Amendments to the Comprehensive Environmental Response Compensation and Liability Act of 1980.

- Resource Conservation and Recovery Act (RCRA) of 1976 (Amended 1984) - Governs the generation, transportation, storage, and disposal of hazardous wastes. RCRA 40 CFR Part 264 standards are used for remedial actions including offsite hauling and disposal of hazardous wastes, onsite capping and landfilling, and groundwater monitoring.

- Safe Drinking Water Act - The Safe Drinking Water Act promulgated National Primary Drinking Water Standard Maximum Contaminant Levels (MCLs). MCLs are enforceable standards for contaminants in public drinking water supply systems. They not only consider health factors, but also the economic and technical feasibility of removing a contaminant from a water supply system. EPA has also recently proposed Maximum Contaminant Level Goals (MCLGs) for several organic and inorganic compounds in drinking water. MCLGs are non-enforceable guidelines that do not consider the technical feasibility of contaminant removal.

- Toxic Substances Control Act of 1976 - The Toxic Substances Control Act (TSCA) provides authority to require testing of chemical substances entering the environment and to regulate them, where necessary. Polychlorinated biphenyl (PCB) regulation and enforcement (40 CFR Part 761) are important aspects of TSCA. 40 CFR Part 761 established regulations for manufacturing, processing, distribution in commerce, and use prohibitions for PCBs.

- USEPA Health Advisories - Health Advisories are non-enforceable guidelines, developed by the EPA Office of Drinking Water, for chemicals that may be intermittently encountered in public water supply systems. Health Advisories are available for short term, longer-term, and lifetime exposures for a 10 kg child and/or a 70 kg adult.

- Clean Water Act (as amended) - Governs point-source discharge through the National Pollutant Discharge Elimination System (NPDES), discharge of dredge or fill materials, and oil and hazardous spills to U.S. waters.

- Ambient Water Quality Criteria - Ambient Water Quality Criteria (AWQC) were developed for 64 pollutants in 1980 (45 CFR Part 231) pursuant to Section 304(a)(1) of the Clean Water Act. In 1983, EPA revised nine criteria previously published in the "Red Book" (Quality Criteria for Water, 1976) and in the 1980 criteria documents. These criteria are not legally enforceable, but have been used by many states to develop enforceable water quality standards. AWQC are available for the protection of human health from exposure to contaminants in drinking water, from ingestion of aquatic biota, and for the protection of freshwater and saltwater aquatic life.

- Clean Air Act of 1967 - Governs air emissions resulting from remedial actions. The Clean Air Act promulgated the National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50). NAAQS are available for six chemicals or groups of chemicals and for airborne particulates. The sources of the contaminant and the route of exposure were considered in the formulation of the standards. These standards do not consider the costs of achievement or the feasibility of implementation. The NAAQS allow for a margin of safety to account for unidentified hazards and effects.

- Section 404(b)(1), Guideline for Specification of Disposal Sites for Dredged or Fill Material (40 CFR Part 230) - Established guidelines applicable to the dredge and fill of wetland environments.

- Rivers and Harbors Act of 1899 (33 CFR Parts 320-327) - Requires permits for construction work that may affect navigable waters.

- Dredged Material Disposal Sites Denial or Restriction Procedures (Section 404 Procedures) (40 CFR Part 231) - Established procedures for prohibiting or withdrawing the specification, or denying, restricting, or

300376

withdrawing the use for specification, of any defined area as a disposal site for dredged or fill material pursuant to Section 404(c) of the Clean Water Act.

- Regulation of Activities Affecting Water of the U.S. (33 CFR Parts 320-329) - U.S. Army Corps of Engineers Regulations that are applicable to wetlands and navigable waters.

- Occupational Health and Safety Act (OSHA requirements; 29 CFR Parts 1910, 1926, and 1904) - OSHA regulations provide occupational safety and health requirements applicable to workers engaged in onsite field activities.

- Federal Floodplain Executive Order (11988) - Provides for considerations of floodplains during remedial actions. This Executive Order is to be considered as implemented by EPA's August 6, 1985 Policy on Floodplains and Wetlands Assessments for CERCLA actions (CERCLA Compliance Policy).

- Federal Wetlands Executive Order (11990) - Provides for consideration of wetlands during remedial actions. This Executive order is to be considered as implemented by EPA's August 6, 1985 Policy on Floodplains and Wetlands Assessments for CERCLA actions (CERCLA Compliance Policy).

- DOT Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1 - 171.500) - Regulates the transport of hazardous waste materials including packaging, shipper equipment, and placarding. These requirements are considered applicable to any wastes shipped offsite for laboratory analysis, treatment, or disposal.

- Endangered Species Act of 1978 (16 USC 1531) - Provides for consideration of the impacts on endangered and threatened species.

- Fish and Wildlife Coordination Act (16 USC 661) - Provides for consideration of the impacts on wetlands and protected habitats.

- Fish and Wildlife Improvement Act of 1978 (16 USC 742a) - Provides for consideration of the impacts on wetlands and protected habitats.

- Fish and Wildlife Conservation Act of 1980 (16 USC 2901) - Provides for consideration of the impacts on wetlands and protected habitats.

- Health Effects Assessments (HEAs) - HEAs present toxicity data for specific chemicals for use in public health assessments. Also considered applicable are Carcinogenic Potency Factors and Reference Doses provided in the Superfund Public Health Evaluation Manual (USEPA, October 1986).

- Groundwater Protection Strategy - EPA's policy is to protect groundwater for its highest present or potential beneficial use. This policy will be incorporated into future regulatory amendments. The strategy designates three categories of groundwater:

  - Class 1 - Special Groundwaters - Waters that are highly vulnerable to contamination and are either irreplaceable or ecologically vital sources of drinking water.

  - Class 2 - Current and Potential Sources of Drinking Water and Waters Having Other Beneficial Uses - Waters that are currently used or that are potentially available.

  - Class 3 - Groundwater Not a Potential Source of Drinking Water and of Limited Beneficial Use - Class 3 groundwater units are further subdivided into two subclasses.

    -- Subclass 3A includes groundwater units that are highly to intermediately interconnected to adjacent groundwater units of a higher class and/or surface waters. They may, as a result, be contributing to the degradation of the adjacent waters. They may be managed at a similar level as Class 2 groundwaters, depending upon the potential for producing adverse effects on the quality of adjacent waters.

    -- Subclass 3B is restricted to ground-units characterized by a low degree of inter-connection to adjacent surface waters or other groundwater units of a higher class within the Classification Review Area. These groundwaters are naturally isolated from sources of drinking waters in such a way that there is little potential for producing adverse effects on quality. They have low resource values outside of mining or waste disposal.

- National Environmental Policy Act of 1969 - Promotes consideration of environmental concern by Federal agencies. Declares a national environmental policy and goals and provides a method for accomplishing these goals.

Commonwealth of Pennsylvania ARARs include the following:

- Solid Waste Management Act of 1980 - Regulates the storage, treatment, and disposal of solid and hazardous wastes.

- Pennsylvania Solid Waste Disposal Regulations - Govern the generation, transportation, storage, and disposal of hazardous wastes. Regulations are used for remedial actions, including offsite disposal of hazardous materials, onsite capping and landfilling, and groundwater monitoring.

- Pennsylvania Clean Streams Law - The objective is reclaim and restore polluted streams. Provides for the protection of streams and water quality control.

- Pennsylvania National Pollutant Discharge Elimination System (NPDES) Rules - Governs point-source discharge to Pennsylvania waters through the Clean Water Act.

- Pennsylvania Water Quality Standards - Sets forth water quality standards for receiving streams based upon designated uses.

- Pennsylvania Wastewater Treatment Requirements - Wastewater treatment regulations required to maintain water quality, including effluent limitations based on best practical control technologies and waste load allocations for pollutants at which minimum treatment requirements have not been established.

- Pennsylvania Industrial Waste Treatment Regulations - Provides requirements and standards for treatment of industrial waste discharges to surface waters and underground waters.

- Pennsylvania Special Water Pollution Regulations - Establishes a procedure for mandatory notification of downstream users in the case of an accident in which a toxic substance enters surface waters. These regulations also specify bonding requirements for solid waste facilities that would ensure closure of a permitted site in a manner that would abate or prevent water pollution.

- Pennsylvania Air Pollution Control Regulations - Governs air emissions from remedial actions. Provides for the control and prevention of air pollutants and guidance for the design and operation of air pollution sources.

- Pennsylvania Storm Water Management Act - Requires measures to control stormwater runoff during alterations or development of land. Stormwater management systems

300379

must be constructed in a manner consistent with the county watershed management plan.

- Pennsylvania Erosion Control Regulations - Governs erosion and sedimentation control resulting from remedial actions that may involve earth-moving activities.

- Dam Safety and Encroachment Act - Requires permits for the construction, operation, or ownership of a dam. Also requires easements or right-of-way for any project that would occupy submerged lands in any navigable lake, river, or stream that is a public highway.

- Pennsylvania Hazardous Substances Transportation Regulations - Regulates the transport of flammable liquids and solids, oxidizing materials, poisons, and corrosive liquids. These requirements may be applicable to any wastes shipped offsite for laboratory analysis, treatment, or disposal.

- Pennsylvania Wild and Scenic Rivers Act, Act No. 283 - Enacted to preserve the aesthetic and recreational qualities of rivers. The regulations (PA Code Title 25, Chapter 11) provide classifications for recommended rivers.

- Pennsylvania Rare and Endangered Species Regulations - Provide for consideration of impacts on rare and endangered species.

TABLE A-1

FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
WHITMOYER LABORATORIES SITE

Contaminant-Specific	
Requirement	**Rationale**
1. Hazardous Waste Requirements (RCRA Subtitle C, 40 CFR, Part 264)	Standards applicable to treating, storing and disposing of hazardous waste.
2. Safe Drinking Water Act	
a. Maximum Contaminant Levels (MCLs)	Remedial actions may provide clean up to the MCLs.
b. Maximum Contaminant Level Goals (MCLGs)	SARA Section 121(d)(2)(A)(ii)
3. Toxic Substances Control Act (15 U.S.C. 2601)	
a. TSCA health data, chemical advisories, and Compliance Program policy	Considered in the public health evaluation.
4. Health Advisories, EPA Office of Drinking Water	RI activities identified presence of chemical for which health advisories are listed.
5. Clean Water Act (PL92-500)	
a. State water quality standards (PA Code Title 25, Chapter 95)	Remedial actions may include discharge to surface waters.
b. Federal ambient water quality criteria (AWQC)	Remedial actions may provide groundwater remediation and discharge to surface waters.
6. Reference Doses (RfD), EPA Office of Research and Development	Considered in the public health evaluation.
7. Health Effects Assessments	Considered in the public health evaluation.
8. Carcinogenic Potency Factors, EPA Environmntal Criteria and Assessment Office; EPA Carcinogen Assessment Group	Considered in the public health assessment.

300381

TABLE A-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
WHITMOYER LABORATORIES SITE
PAGE TWO

Contaminant-Specific	
Requirement	**Rationale**
9. Clean Air Act (42 USC 7401)	
a. National Ambient Air Quality Standards (NAAQS) for six criteria pollutants (40 CFR Part 50)	Remedial alternatives may include incineration or groundwater volatilization technologies.
b. Public health basis to list pollutants as hazardous under Section 112 of the Clean Air Act	Remedial alternatives may include incineration or groundwater volatilization technologies.

300382

TABLE A-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
WHITMOYER LABORATORIES SITE
PAGE THREE

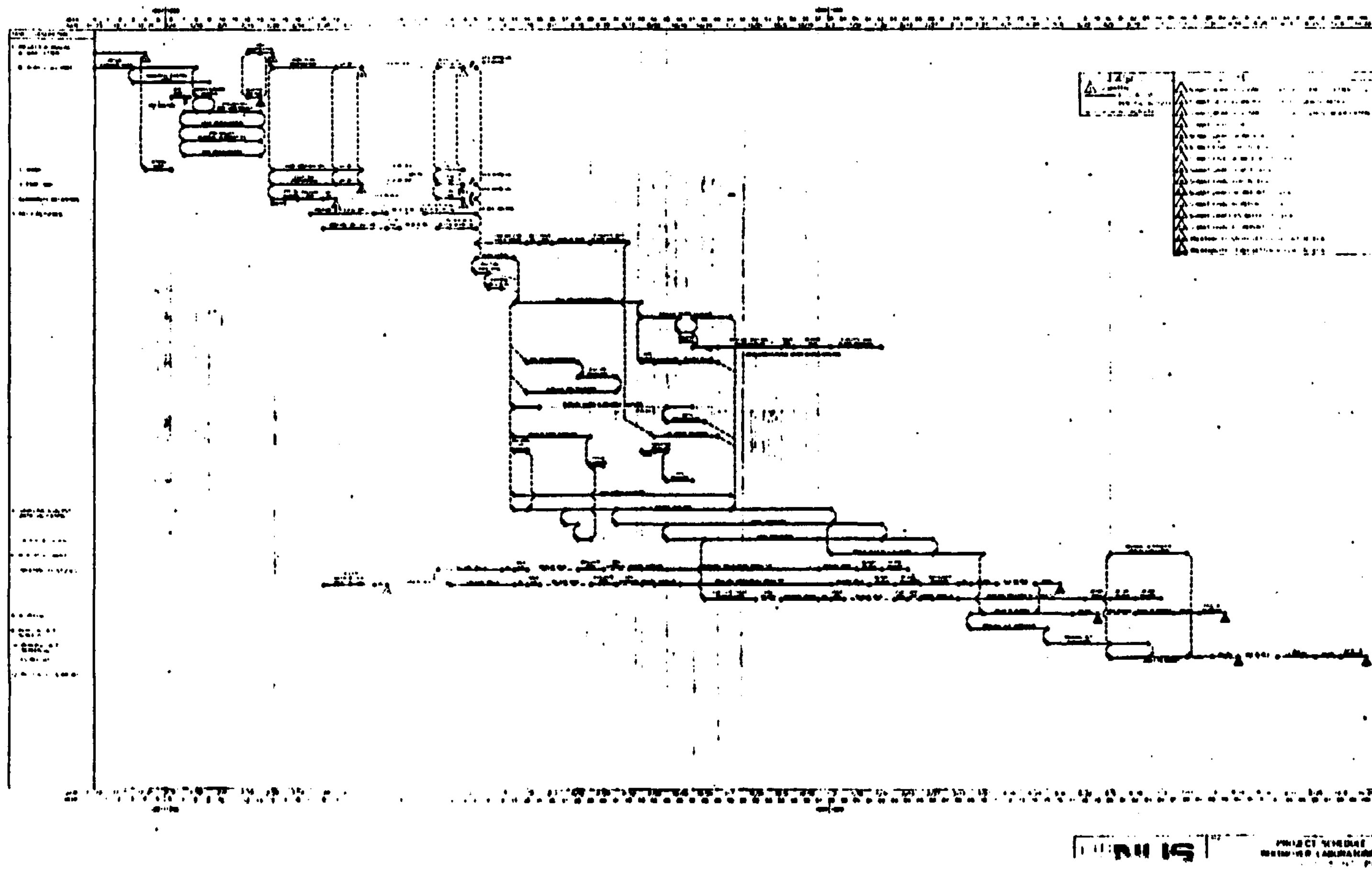
Location-Specific	
Requirement	Rationale
1. Rivers and Harbors Act of 1899 33 CFR Parts 320-327	Remedial alternatives at site may affect Tulpehocken Creek and the Union Canal.
2. Dredged Material Disposal Sites Denial or Restriction Procedures (404(c); 40 CFR, Part 231)	Remedial alternatives at site may include dredging and filling in wetlands.
3. Regulation of Activities Affecting Water of the U.S. (33 CFR, Parts 320-329)	Corps of Engineers regulations apply to both wetlands and navigable waters (Section 10, Waters).
4. Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material (40 CFR, Part 230)	Remedial alternatives at site may include dredging and filling in wetlands.
5. Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)	Both floodplain and wetland resources may be affected by the site remedial alternatives.
6. EPA s Groundwater Protection Strategy	Remedial alternatives must considered EPA classification of groundwater at the site
7. Endangered Species Act of 1978 (16 USC 1531)	Considered in the public health and environmental assessment.
8. Fish and Wildlife Coordination Act (16 USC 661)	Remedial alternatives may affect wetlands and protected habitats.
9. Fish & Wildlife Improvement Act of 1978 (16 USC 742)	Remedial alternatives may affect wetlands and protected habitats.

TABLE A-1
FEDERAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS
WHITMOYER LABORATORIES SITE
PAGE FOUR

Action-Specific	
Requirement	**Rationale**
1. OSHA Requirements (29 CFR, Parts 1910, 1926, and 1904)	Required for workers engaged in onsite remedial activities.
2. DOT Rules for Hazardous Materials Transport (49 CFR, Parts 107, 171.1-171.500)	Remedial alternatives include offsite treatment and disposal.
3. Safe Drinking Water Act	
a. Underground Injection Control Regulations (40 CFR Parts 144, 145, 146, and 147)	May be applicable to onsite groundwater recirculation systems
4. Guidance on Remedial Actions for Contaminated Groundwater at Superfund Sites, EPA Office of Emergency and Remedial Resposne	Appropriate guidance for aquifer restoration.
5. Clean Water Act	
a. NPDES Permit Requirements	Remedial alternatives may include discharge to surface waters.
b. Federal Ambient Water Quality Criteria	Remedial alternatives may include discharge to surface waters.
6. Threshold Limit Values, American Conference of Governmental Industrial Hygienists.	Appropriate requirements for air concentrations during remedial activities.

Source: 50 Federal Register 224, Wednesday, November 20, 1985.

FIGURE 1
PROJECT SCHEDULE: WHITMOYER LABORATORIES



306385

TABLE A-2
COMMONWEALTH OF PENNSYLVANIA APPLICABLE OR RELEVANT AND APPROPRIATE STATE REQUIREMENTS
WHITMOYER LABORATORIES SITE
PAGE TWO

Action-Specific	
Requirement	**Rationale**
1. Pennsylvania Solid Waste Disposal Regulations, PA Code Title 25, Chapter 75	Standards for treating, storing, and disposing of hazardous wastes.
2. Pennsylvania Pollutant Discharge Elimination System (NPDES) Rules, PA Code Title 25, Chapter 92	Remedial actions may include discharge to surface waters.
3. Pennsylvania Wastewater Treatment Requirements, PA Code Title 25, Chapter 95	Remedial actions may include discharge to surface waters.
4. Pennsylvania Industrial Waste Regulations, PA Code Title 25, Chapter 97	Remedial actions may include discharge to surface waters.
5. Pennsylvania Special Water Pollution Regulations, PA Code Title 25, Chapter 101	Applicable for permitted solid waste disposal facilities.
5. Pennsylvania Storm Water Management Act of October 4, 1978, Act No. 167	Remedial actions may require stormwater management systems.
7. Pennsylvania Erosion Control Regulations, PA Code Title 25, Chapter 102	Soil disturbances during proposed remedial actions may require erosion and sedimentation control measures.
8. Pennsylvania Hazardous Substances Transportation Regulations PA Code Title 13 (Flammable Liquids and Flammable Solids) and Title 15 (Oxidizing Materials, Poisons, and Corrosive Liquids)	Applicable to wastes shipped offsite for analysis, treatment, or disposal.

Source: Pennsylvania Environmental Research Foundation, Inc. 1980

EPA REGION III
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOC ID 135589
PAGE # 300387

IMAGERY COVER SHEET
UNSCANNABLE ITEM

SITE NAME Whitmoyer Labs

OPERABLE UNIT OU1

ADMINISTRATIVE RECORDS- SECTION III VOLUME A

REPORT OR DOCUMENT TITLE Final Work Plan

DATE OF DOCUMENT 10-Jun-88

DESCRIPTON OF IMAGERY Project schedule

NUMBER AND TYPE OF IMAGERY ITEM(S) 1 oversized map